Foreword

The Soil Survey of Cassia County, Idaho, Western Part, contains much information useful in any laid-planning program. Of prime importance are the predictions of soil behavior for selected land uses. Also highlighted are limitations or hazards to land uses that are inherent in the soil, improvements needed to overcome these limitations, and the impact that selected land uses will have on the environment.

This soil survey has been prepared for many different users. Farmers, ranchers, foresters, and agronomists can use it to determine the potential of the soil and the management practices required for food and fiber production. Planners, community officials, engineers, developers, builders, and homebuyers can use it to plan land use, select sites for construction, develop soil resources, or identify any special practices that may be needed to insure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the soil survey to help them understand, protect, and enhance the environment.

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

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map; the location of each kind of soil is shown on detailed soil maps. Each kind of soil in the survey area is described, and much information is given about each soil for specific uses. Additional information or assistance in using this publication can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

This soil survey can be useful in the conservation, development, and productive use of soil, water, and other resources.

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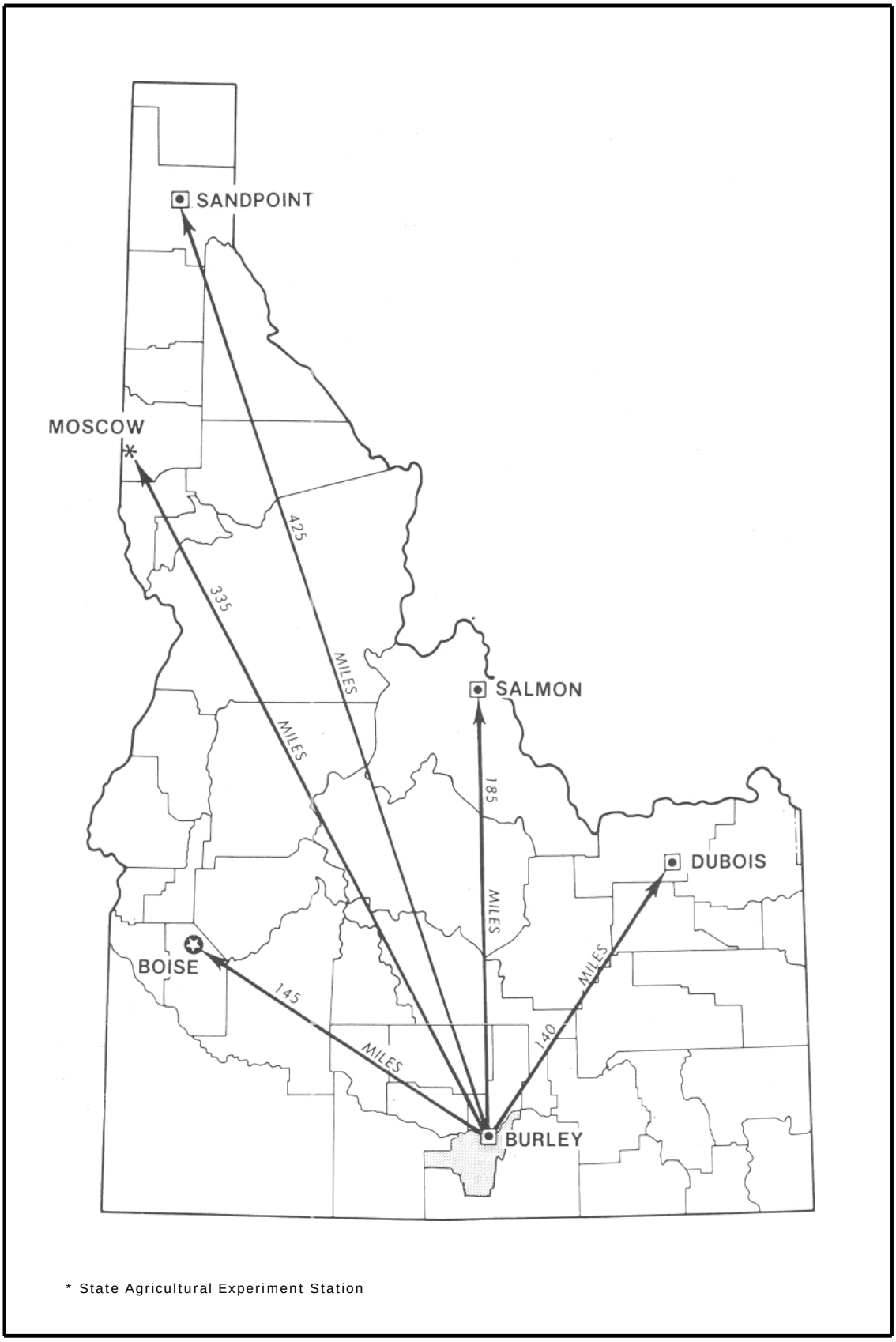

* State Agricultural Experiment Station

Location of Cassia County, Idaho, Western Part

SOIL SURVEY OF CASSIA COUNTY, IDAHO, WESTERN PART

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CASSIA COUNTY, IDAHO, WESTERN PART is in the extreme south-central part of Idaho (see faring page). The western part is north of the boundary line between townships 14 and 15. Cassia County is bounded on the east by the Albion Mountains. It is bounded on the north by the Snake River and on the west by Twin Falls County. It has a total area of 366,720 acres, or 573 square miles. Elevations vary between about 4,100 feet at the shoreline of the Snake River and 7,000 feet along the eastern boundary in the Albion Mountain Range.

The survey area consists of the wide, low gradient, Goose Creek Valley merging with the Snake River Plain. The contact between the two is gradual and not well defined. The soils in Goose Creek Valley formed in water-deposited materials, and the soils on the Snake River Plain formed in wind-laid and water-deposited materials over lava flows. The Valley joins the Albion Mountain Range on the east, Middle Mountain on the south, and the Bostetter Mountain Range on the west. The soils on the hills and mountains are moderately deep, and shallow over limestone, quartzite, and lava.

General nature of the county

This section gives general information concerning the county. It discusses settlement, natural resources, climate, and farming.

Settlement of the county

Before 1800 there were no known permanent residents in this area (3). Indians used the area for hunting, trapping, and temporary campgrounds. The early trappers recorded that elk and buffalo were plentiful. The earliest written record of explorers or trappers in this area included Lewis and Clark in 1805 and trappers of the Pacific Fur Company in 1811 and of the Hudson Bay Fur Company in 1825. The historic Oregon Trail crosses the northern part of the survey area. The early pioneers passed through and used the area to harvest game for food.

Early, settlers were located along creek banks within the area after completion of the first transcontinental railroad in 1869. Many former railroad workers moved north into the area. Cattlemen, sheepmen, and fur traders also settled there. Mormon settlements were also responsible for the early development in much of the area, especially in the town of Oakley.

Cattle raising was the main type of agriculture until about 1900 when the sheep industry became most prominent. Irrigated farming was introduced about 1911.

In 1911, an earth dam and canals were constructed at the mouth of Goose Creek Canyon. The reservoir collects water from Trapper, Birch, Cottonwood, and Goose Creeks. It was believed that the earth dam, the largest in the world at that time, would collect enough water for all the land to be farmed. This was disproved, and fewer acres than originally planned were irrigated.

The Minidoka Dam, on the Snake River, was completed in 1908. Sufficient water to properly irrigate the project was not received until 1910 and 1911. The Burley Irrigation District was organized in 1918. The plan of construction provided for 3 lifts in the northern part of the survey area. The first irrigation well was drilled in 1950. Since then, deep wells have become an important source of irrigation water.

Natural resources

Soil and water are the most important natural resources in the survey area. Crops produced on the farms and the livestock that graze the grassland are marketable products derived from the natural resources.

The northern part of the survey area receives water from the Snake River and has adequate water supplies. Most of the other areas receive water from local runoff or irrigation wells. These sources are not always dependable, and sometimes production is reduced. The Bureau of Reclamation is studying the feasibility of supplying water from the Snake River to other parts of the survey area.

Industry in the survey area is mostly connected with agriculture. It employs food processors, seed and fertilizer suppliers, and farm equipment suppliers.

Mineral resources are of minor extent in the survey area (2). A geological survey of Cassia County indicates that metallic resources are of little significance. There are, however, good sources of building store, limestone, road gravel, quartzite, volcanic ash, mica, clay, feldspar, and granite.

Farming

The soil and climate in the survey area are suited to a variety of crops including Irish potatoes, dry beans, wheat, barley, alfalfa hay, sugar beets, and pasture (fig. 1). Limited amounts of green beans, peas, and sweet corn are grown for food processors. Occasionally seed crops are harvested from alfalfa, clover, grass, beans, peas, onions, and radishes. In 1905, H. W. Marian made a detailed soil survey of the land to be irrigated by the water made available through the construction of the Minidoka Dam (3). As a result of his work, growing alfalfa, grains, timothy, clover, sugar beets, and potatoes was recommended. These crops are very similar to the major crops presently grown.

The enactment of legislation to form Soil Conservation Districts in 1937 was of interest to many land owners, because it allowed them to form organizations to solve their mutual problems. The West Cassia Soil and Water Conservation District, which includes the survey area, was organized September 22, 1958 (11).

Climate

Data for this section were obtained from records at the National Climatic Center, Asheville, North Carolina.

In Cassia County, Western Part, rainfall is adequate for production of nonirrigated crops only on the east side of the survey area at higher elevations. These areas require that cropland be left idle alternate years to conserve moisture. All other crops are irrigated with water from local runoff, from the Snake River, or from irrigation wells. The length of the growing season and growing degree days place moderate limitations on those kinds of crops that can be grown economically. The weather is consistent enough that there have not been any major crop failures for adapted crops because of early frost or too cool a growing season. Occasional hail storms cause damage to crops and reduce yields in some years.

Table 1 shows temperature and precipitation data, for the period 1951 to 1973, recorded at Oakley, Idaho but representative of the entire survey area. Table 2 shows probable dates of the first and last freeze. Table 3 provides data on the length of the growing season.

In winter, the average temperature is 31.5 degrees F, and the average daily minimum is 21.8 degrees F. The absolute lowest temperature during the period of record, was -23 degrees F, observed at Oakley on January 22, 1962. In summer, the average temperature is 67.4 degrees, and the average daily maximum is 82.9 degrees. The absolute highest temperature was 104 degrees F, recorded on June 21, 1955.

Growing degrees days, shown in table 1, are equivalent to "heat units." Starting in spring, they accumulate by the amount that the average daily temperature exceeds the base temperature. The normal monthly accumulation is used to schedule single or successive crop plantings within the seasonal limits of the last freeze in spring and the first freeze in fall.

Table 1 indicates that the total precipitation is 12 inches. Of this total, 7 inches or 58 percent, generally falls during the period April through September, which includes the growing season for most crops. Two years in ten, rainfall between April and September is less than 5 inches. The heaviest 1-day rainfall during the period of record was 1.40 inches at Oakley on May 29, 1974. Thunderstorms number about 24 each year, 17 of which occur in summer.

Average seasonal snowfall is 31 inches. The deepest snow at any one time during the period of record was 14 inches. On the average, 13 days have at least 1 inch of snow on the ground, but the number of days varies greatly from year to year.

The average relative humidity in midafternoon in spring is less than 39 percent; during the rest of the year it is about 44 percent. Humidity is higher at night in all seasons, and the average at dawn is about 72 percent. The percentage of possible sunshine is 78 in summer and 42 in winter. The prevailing direction of the wind is from the southwest. Average windspeed is 10.3 miles per hour. Average windspeed is 11.7 miles per hour in April.

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 potential of each soil map unit is discussed for major land use. Soil properties that pose limitations to the use are indicated. The soil potentials are based on the assumption that practices in common use in the survey area are being used to overcome soil limitations. These ratings reflect the ease of overcoming the soil limitations and the probability of soil problems persisting after such practices are used.

Major land uses considered are for cultivated farm crops, rangeland, urban uses, intensive recreation areas, and extensive recreation areas. Cultivated farm crops include those grown extensively by farmers in the survey area. These are usually grown on irrigated farmland, but some nonirrigated crops are also grown. Rangeland includes land that is used for grazing domestic livestock. Urban uses include residential, commercial, and industrial developments. Intensive recreation areas are campsites, picnic areas, ball diamonds, and similar areas that are subject to heavy foot traffic. Extensive recreation areas include those for nature study and wilderness uses. Wildlife inhabits most of the land even though it has other major land uses.

1. Mackey-Mulett

Moderately deep and shallow, undulating to very steep, well drained stony soils over bedrock

Areas of these soils border the survey area on the east, west, and south. These soils are on hills, mountains, and escarpments. Elevations are higher than those of other map units.

This map unit makes up about 17 percent of the survey area (fig. 2). About 32 percent of the map unit is Mackey soils, 10 percent is Mulett soils, 10 percent is Vipont soils, 10 percent is Alpowa soils, 10 percent is Rock outcrop, and 28 percent is soils of minor extent.

In most places, Mackey soils are along escarpments and are moderately steep to very steep. They are moderately deep and are very stony throughout the soil above the bedrock. Mulett soils are gently rolling to hilly and are on hillsides. They are shallow and very stony throughout the soil above the bedrock.

Soils of minor extent in this map unit are gently sloping to moderately steep, shallow Itca soils; moderately deep Kanlee soils; and shallow Reywat soils. Also included are steep and very steep, shallow Hymas soils and moderately deep Winu soils. Kanlee and Winu soils are on north exposures.

This map unit is used mainly for rangeland, wildlife habitat, and water supply. It also is used for such recreation as camping, fishing, and hiking. Wildlife is dominantly mule deer, forest grouse, and nongame species of rodents, birds, and predators. Rangeland requires careful management since mechanical practices such as reseeding are not feasible because of steep slopes and very stony soils. Most of the streams in the survey area originate outside the area but this map unit contributes significantly to their water volume.

This map unit has only limited potential for other uses. Any use such as urban development or cropland would cause accelerated soil erosion, destruction of wildlife habitat, and pollution of water supply.

2. Aysees-Garbutt

Deep, nearly level to strongly sloping, somewhat excessively drained and well drained, alkali affected soils

Areas of these soils are in the southwestern part of the survey area and extend northwest from the town of Oakley. These soils are on alluvial fan terraces that interconnect the hills and escarpments with the valley flood plain.

This map unit makes up about 8 percent of the survey area (fig. 3). About 61 percent of the map unit is Aysees soils, 22 percent is Garbutt soils, and 17 percent is soils of minor extent.

Aysees soils are near the upper part of alluvial fans in most areas. They are very gravelly below the surface layer. Garbutt soils are nearly level. They are loam and silt loam throughout, and they are moderately saline.

Soils of minor extent in this map unit are the strongly saline-alkali affected, moderately well drained Bram soils at the base of alluvial fans and the nearly level Buko and Paniogue soils.

This map unit is used for rangeland, and small areas are used for irrigated cropland. Wildlife is mostly nongame birds, rodents, and predators, although there are some upland game birds. Cropland that is developed requires leaching irrigation to retain an acceptable level of salinity. Aysees soils require careful management when used for range. They are not suitable for reseeding because of the low moisture holding capacity of the soil. Garbutt soils are suitable for reseeding adapted introduced grasses.

This map unit has poor potential as irrigated cropland because of droughtiness of the Aysees soils and salinity. Aysees soils are better suited to sprinkler irrigation than to surface irrigation. They have good characteristics for supporting buildings but poor for corrosion of metals that are in contact with the soil. This map unit has fair potential for recreational development including camp or picnic sites or paths and trails.

3. Weeks-Alpowa

Deep, nearly level to strongly sloping, well drained soils

Areas of these soils are mostly in the southern and eastern parts of the survey area, but a few are in the western part. These soils are on alluvial fan terraces that extend from the hills and escarpments to the valley.

This map unit makes up about 13 percent of the survey area (fig. 4). About 40 percent of the map unit is Weeks soils, 26 percent is Alpowa soils, 14 percent is Disautel soils, and 20 percent is soils of minor extent.

Weeks soils are nearly level to moderately sloping and are on fan terraces near the lower part of the fans. They are loam and clay loam to a depth of 60 inches and have a weak hardpan at a moderate depth. Alpowa soils are in the upper areas of the alluvial fans and near old ephemeral stream channels. Most areas are nearly level to strongly sloping, but a few are steep and very steep where escarpments have formed. Alpowa soils are very gravelly or very cobbly below the surface layer.

Soils of minor extent in this map unit are the nearly level to moderately sloping Disautel soils on broad drainage channels and outwash fans. Also included on alluvial fans are nearly level to moderately sloping Declo soils and nearly level McMeen and Kimama soils.

This map unit is used mainly for rangeland and irrigated cropland. The rangeland can be reseeded to adapted species. The cropland is usually irrigated by the sprinkler method, although some of the more level areas use a surface irrigation system. This map unit provides habitat for some upland birds and nongame predators and rodents.

This map unit has potential for the development of irrigated cropland if new water sources are developed. Slope is a hazard to irrigation in some places. This map unit also has potential for use as wildlife habitat and for recreational development. This area is too dry for nonirrigated farming of conventional crops, but it is suitable for reseeding adapted wildlife food plants.

4. Buko-Paniogue

Deep, nearly level to gently sloping, well drained soils, moderately deep over gravel and sand

Areas of these soils are on stream terraces on Goose Creek or in other drainageways in the survey area. These soils are on old gravel bars partially buried by finer alluvium.

This map unit makes up about 10 percent of the survey area. About 60 percent of the map unit is Buko soils, 35 percent is Paniogue soils, and 5 percent is soils of minor extent.

Buko and Paniogue soils are on gravel bars in old stream channels. They are loams underlain by sand and gravel at a moderate depth. Buko soils are weakly cemented above the sand and gravel. Buko and Paniogue soils are intermingled in a very complex pattern.

Soils of minor extent in this map unit are the nearly level to gently sloping Declo and Escalante soils.

This map unit is used mainly for irrigated cropland, but a few areas are used for rangeland. It is also the main source of gravel in the area. This map unit has limited use for residential development. Wildlife includes upland birds, rodents, and predators.

This map unit is well suited to irrigated cropland. It is and will be a good source for gravel. It has potential for wildlife habitat, for residential development, and for recreational use. When this map unit is used for cropland, careful irrigation is needed. Overirrigation on the site causes the water table to rise in parts of this map unit and in surrounding areas. In order to increase wildlife, cropping practices must be altered to provide more shelter and food for desired species.

5. Portneuf-Pocatello

Deep, nearly level to moderately steep, well drained soils

Large areas of these soils are west of the city of Burley, and small pockets are scattered throughout the survey area. These soils are on rolling hills, alluvial tans, and old lake remnants.

This map unit makes up 14 percent of the survey area (fig. 5). About 75 percent of the map unit is Portneuf soils, 17 percent is Pocatello soils, and 8 percent is soils of minor extent.

Portneuf soils formed in the silty alluvium or loess that covers the Snake River basalt plain. They are deep silt loams that have a layer of lime containing hard, cemented nodules at a shallow depth. Pocatello soils are deep, undeveloped soils that formed in recent silty alluvium or loess.

Soils of minor extent in this map unit are nearly level Rad soils intermixed with Portneuf soils. Also included are shallow Trevino soils.

This map unit is used for irrigated cropland, for rangeland, and for wildlife habitat. Surface and sprinkler irrigation systems are used on the cropland. Much of the rangeland has been reseeded to crested wheatgrass. Wildlife includes upland birds, rodents, and predators.

The potential for irrigated cropland development is good if the water is available. The type of irrigation system used is based on information obtained from the more detailed soil maps. These soils are too dry for nonirrigated farming, but they are suitable for reseeding adapted wildlife food plants. This map unit has potential for wildlife habitat and for recreational development.

6. Declo-Escalante

Deep, nearly level to moderately sloping, well drained soils

Areas of these soils are scattered throughout the valleys of the survey area. These soils are slightly higher in elevation than the adjoining Buko-Paniogue and Drax-Goose Creek-Beetville map units.

This map unit makes up about 7 percent of the survey area. About 56 percent of the map unit is Declo soils, 22 percent is Escalante soils, 16 percent is Paulville soils, and 6 percent is soils of minor extent.

Declo and Escalante soils are on broad valley terraces. Declo soils are loam throughout, and Escalante soils are sandy loam.

Soils of minor extent in this map unit are Paulville soils in recent playas, nearly level Wodskow and Goose Creek soils in depressions, and moderately deep Somsen and Taunton soils.

This map unit is used for irrigated cropland, limited urban development, and wildlife habitat. Irrigated crops include small grains, sugar beets, beans, corn silage, dry beans, and alfalfa. Overirrigation causes water table problems in this and nearby areas. The high lime content causes nutrient problems in these soils. These soils are treated with sulfate fertilizer.

This map unit has good potential for many irrigated crops. With specific management practices, such wildlife as upland game birds can be increased. This map unit has potential for residential development or recreational activities. When planning residential sites, low soil strength, potential frost action, and the water table are limitations that need to be overcome.

7. Trevino-Taunton

Shallow and moderately deep, nearly level to moderately steep, well drained and somewhat excessively drained soils over bedrock and hardpan

Areas of these soils are in the northern part of the survey area on the Snake River basalt plain.

This map unit makes up about 8 percent of the survey area. About 30 percent of the map unit is Trevino soils, 25 percent is Taunton soils, 13 percent is Somsen soils, 10 percent is Scoon soils, 10 percent is Rock outcrop, and 12 percent is soils of minor extent.

Trevino soils are on basalt ridgecrests and sides. Bedrock is between a depth of 10 and 20 inches. Taunton soils are underlain by basalt flows on valley terraces. They are nearly level to strongly sloping and have an indurated hardpan between a depth of 20 and 40 inches.

Soils of minor extent in this map unit are moderately deep Scoon, Somsen, and Vining soils; deep, gently sloping to strongly sloping, sandy Quincy soils; and deep, nearly level to moderately sloping Escalante and Portneuf soils in small basins. Some areas of Rock outcrop are also included.

This map unit is used for rangeland and irrigated cropland. Wildlife is in both of these areas. Cropland is dominantly irrigated by the sprinkler method. There has been severe soil blowing in this area because of overgrazing of range and improper farming practices. Wildlife in nonirrigated areas includes nongame birds, rodents, and predators. Upland game birds are in irrigated areas.

This map unit has poor potential as irrigated cropland. Somsen and Taunton soils are best suited to irrigated cropland. Nonirrigated cropland is not feasible because of inadequate precipitation. Seeding plants for wildlife or for replacing depleted range is feasible on most soils if adapted species are used. Residential development or recreational use is limited because of the depth to bedrock and the hardpan.

8. Drax-Goose Creek-Beetville

Deep, nearly level, moderately well drained and somewhat poorly drained soils

Areas of these soils are mostly in the central part of the survey area along Goose Creek and other drainageways. These soils are on valley bottoms.

This map unit makes up about 10 percent of the survey area (fig. 6). About 50 percent of the map unit is Drax soils, 24 percent is Goose Creek soils, 22 percent is Beetville soils, and 4 percent is soils of minor extent.

Drax soils are dominantly silt loam throughout, and they have a dark colored surface layer that is less than 20

inches thick. Goose Creek soils are silt loam and silty *clay* loam throughout, and they have a dark colored surface layer more than 20 inches thick. Beetville s ails are dominantly sandy loam below the surface layer, and they are on old sand bars. Goose Creek soils are on bottoms, and Drax soils are in slightly higher position. The water table is generally below a depth of 48 inches in the soils of this map unit, but in a few areas it is within 30 inches of the surface for a few months of most years.

Soils of minor extent in this map unit are the wet Abo and Wodskow soils in depressions.

This map unit is used for irrigated cropland and residential development. Such wildlife as upland game birds are in the cropped areas. This map unit has few limitations for irrigated cropland, except excessive irrigation causes the water table to rise. Residential areas have problems with water in basements and with damage to paved surfaces because of frost action and low soil strength.

This map unit has good potential as irrigated cropland. It has potential for residential development, but soil strength, the water table, and potential frost action are limitations that need to be overcome. Cropland can attract more upland birds if shelter is provided. This map unit also has potential for recreational use.

9. Wodskow-Abo

Deep, nearly level, somewhat poorly drained and moderately well drained soils

Areas of these soils are in the lower elevations of the survey area in Goose Creek Valley, near Declo, and along the Snake River. These soils are on flood plains, low valley terraces, lake terraces, or in drainageways.

This map unit makes up about 6 percent of the survey area. About 77 percent of the map unit is Wodskow soils, 11 percent is Abo soils and 12 percent is soils of minor extent.

Wodskow soils generally are on flood plains and in drainageways. They are sandy loam and have lime concentration below the surface layer. Abo soils are silt loam and have a silty clay loam subsoil. They are in low valleys or on lake terraces. About 50 percent of the Wodskow soils have been drained by diverting the natural water source or by impounding it; the rest is somewhat poorly drained.

Soils of minor extent in this map unit are saline-alkali affected Abo Variant soils along the Snake River.

This map unit is used for irrigated cropland. It also provides habitat for upland birds, rodents, and predators. The soils in this map unit are either drained by diversion of the original water source or they require drainage for effective use as cropland.

This map unit has good potential as cropland and fair potential as wetland wildlife habitat. Abo soils and Abo Variant soils have good potential for producing food and shelter for wildlife. This map unit has potential for recreational use on shoreline facilities for water-based recreation, as nature study areas, and for the development of parks. Construction of service and sanitation facilities requires special design to prevent ground water pollution or foundation failure.

10. Bedke-Neeley

Deep, nearly level to very steep, well drained soils

Areas of these soils are on hills and in valleys mostly on the east side of the survey area. A few areas are on the extreme west side. These soils are on alluvial fans, terraces, and hillsides.

This map unit makes up about 7 percent of the survey area. About 55 percent of the map unit is Bedke soils, 23 percent is Neeley soils, 14 percent is Kucera soils, and 8 percent is soils of minor extent.

Bedke soils are nearly level to strongly sloping. They formed in alluvium. They have a well developed silt loam or silty clay loam subsoil and are weakly cemented below this. Neeley soils are moderately sloping or strongly sloping, have a dark colored surface layer, and have lime accumulation immediately below this. They are on loess covered uplands.

Soils of minor extent in this map unit are moderately steep to very steep Kucera soils on north exposures, Alpowa soils on escarpment slopes, and Disautel soils in drainageways.

This map unit is used in most areas for nonirrigated cropland. A few areas are used for rangeland and irrigated cropland. The rangeland is mostly on the Kucera soil. Sprinkler irrigation is used on most of the irrigated cropland in the lower, less steep areas of Bedke soils. Wildlife includes upland birds, rodents, predators, and some antelope.

This map unit has good potential as irrigated and nonirrigated cropland, but it requires protection against accelerated erosion. Irrigated cropland should be restricted to less steep slopes using the sprinkler system. If properly managed, this area has potential as openland and rangeland wildlife habitat. It could also be used for camping, picnicking, or for paths and trails.

Broad land use considerations

Irrigated farmland is the most important land use in the survey area. Approximately 158,000 acres or about 58 percent of the privately owned land is irrigated farmland; about 16,088 acres, or 6 percent, is nonirrigated farmland; and about 170,332 acres is rangeland, including private and public land ownership. About 22,300 acres are used for nonfarm uses, such as residence, industry, recreation, and business. It is anticipated that an additional 4,640 acres will be used for irrigated farmland in the next 5 years. During this same period about 260 acres will be taken out of irrigation and used for other purposes.

The Wodskow-Abo, Declo-Escalante, Drax-Goose Creek-Beetville, and Buko-Paniogue map units are presently used for irrigated farmland. Irrigated farmland

is the dominant land use for these map units; other uses are urban development, recreation, and sources for gravel in the Buko-Paniogue map unit. The Aysees-Garbutt, Weeks-Alpowa, Portneuf-Pocatello, Trevino-Taunton, and Bedke-Neeley map units are also used for irrigated farmland. These map units include areas that are changing from rangeland or nonirrigated farmland to irrigated farmland. The Weeks-Alpowa, Portneuf-Pocatello, and Bedke-Neeley map units include sloping soils that require carefully designed irrigation systems to control erosion. Sprinkler irrigation systems will be used in these areas. The Trevino-Taunton map unit includes soils that are moderately deep or shallow to bedrock or hardpan and need more frequent irrigation. Leaving the shallow soils in permanent cover instead of cropping them is recommended.

The Declo-Escalante and Trevino-Taunton map units include soils that need special treatment to control soil blowing. These soils have a sandy loam and loamy sand surface layer. Keeping a permanent cover of hay or grass or well anchored mulch of plant residue on these soils is the most effective way of protecting them.

The soils of the Wodskow-Abo map unit are well suited to water-based recreation because of their proximity to natural water areas. They also have potential for parks, play areas, and nature study areas. This map unit is irrigated. It is adversely affected by overirrigation. As water use becomes more efficient and as canals and ditches are lined, the water table caused by overirrigation will become less of a problem.

There is rangeland wildlife in the Mackey-Mulett map unit. This map unit also has good potential for camping, hiking, and limited fishing. It is used mostly as rangeland for cattle. Upland game birds, such as pheasants, are on the irrigated farmland in map units such as Drax-Goose Creek-Beetville and Declo-Escalante. Special management, such as special plantings for food and shelter, is needed for game birds to remain the dominant species in the area.

The Bedke-Neeley map unit contains nearly all of the nonirrigated farmland. Minimum tillage and contour farming are important in these areas. Because of the amount of precipitation, these soils are left idle and cropped in alternate years to conserve moisture.

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. The present use is discussed and the potential of the soil for various major land uses is estimated. 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 Declo series, for example, was named for the town of Declo in Cassia 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, Portneuf silt loam, 1 to 3 percent slopes, is one of several phases within the Portneuf series.

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

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. Buko-Paniogue complex 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. Pits 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 4, 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-Abo loam. This is a deep, moderately well drained, nearly level soil on flood plains or lake terraces. Elevation ranges from 4,100 to 4,550 feet. This soil formed in alluvium or lake sediment derived from mixed sources. Average annual precipitation is about 9 inches, average annual air temperature is about 49 degrees F, and the frost-free season is 125 to 140 days.

Included with this soil in mapping are soils that have a loamy sand surface layer where this soil is associated with coarser textured soils. This included soil makes up about 5 percent of the total unit. Also included are Abo clay loam in small depressions and Wodskow silt loam scattered throughout the map unit. They each make up about 5 percent of the total unit.

In a typical profile the surface layer is very pale brown loam about 2 inches thick and silty clay loam about 4 inches thick. The subsoil is very pale brown or pale brown silty clay loam and clay loam about 8 inches thick. The substratum is stratified very pale brown and pale brown loam, very fine sandy loam, and fine sandy loam to a depth of 51 inches. It is mottled below a depth of 20 inches. Light brownish gray loamy fine sand is between a depth of 51 and 60 inches. A layer of lime accumulation is between a depth of 9 and 47 inches. The soil is moderately alkaline to a depth of 47 inches and is strongly alkaline below that.

The water table is generally below a depth of 60 inches but rises to within 30 to 40 inches of the surface for short periods during the peak irrigation season. This soil is subject to rare flooding.

Permeability is moderately slow. Effective rooting depth is generally 60 inches or more. Available water capacity is 8 to 10 inches. Surface runoff is slow. The hazards of erosion and soil blowing are slight, except for the included sandy loam and loamy sand soils, where the hazard of soil blowing is high.

This soil is used for irrigated crops, pasture, and hay in nearly all areas. It has potential for recreation and for wildlife habitat. Recreation facilities need to be designed to allow for the moderately slow permeability. The fluctuating water table affects maintenance and construction costs of the facilities. The ponds for wildlife require special design to reduce seepage loss.

Crops grown are sugar beets, wheat, barley, potatoes, corn, dry beans, silage, pasture, and alfalfa hay. To maintain good soil tilth, it is important to rotate crops. Crop rotation should provide for a balance between such soil-depleting crops as sugar beets and potatoes, and such soil-building crops as alfalfa. Nitrogen fertilizer is beneficial to all crops except legumes. Phosphorous fertilizer is beneficial to all crops. Crop residue and manure are also needed in this soil to maintain good soil tilth.

Irrigation methods suited to this soil are border, furrow, corrugation, and sprinkler. Because of the moderately slow permeability, water must be applied slowly for long periods. The muddy surface layer hinders movement of sprinklers. Care must be taken not to aggravate the water table by adding more water than necessary to fill the soil.

This soil is suited to habitat for ring-necked pheasant, Hungarian partridge, mourning dove, and nongame birds. Openland habitat can be improved or maintained for these animals by leaving grassland undisturbed for nesting sites, by leaving unharvested grain crops for food, and by planting trees and shrubs where winter cover is needed. Where this soil is adjacent to large bodies of water, it is an important waterfowl feeding and nesting site. This soil has potential for trees and shrubs which could support a limited number of deer.

This soil is used for homesites and roads in rural areas. Because of low strength, special design considerations are required. Houses with basements should not be excavated below a depth of 24 inches, otherwise artificial drainage should be provided. Septic tanks need to be designed to avoid contamination of ground water. Sewage should be carried away by a community system. Capability subclass IIw irrigated.

2-Abo Variant loam. This is a deep, poorly drained, saline-alkali, nearly level soil on flood plains or lake terraces. Elevation ranges from 4,100 to 4,400 feet. This soil formed in alluvium or lake sediment derived from mixed sources. Average annual precipitation is about 9 inches, average annual air temperature is about 49 degrees F, and the frost-free season is 120 to 140 days.

Included with this soil in mapping is Abo Variant that has a sandy loam or loamy sand surface layer on small overwashes and shallow sand bars and Wodskow silt loam scattered throughout the map unit. These included soils each make up 5 percent of the total unit. Also included is a deep soil that has clay, silty clay, or silty clay loam to a depth of 40 inches or more, in oxbows. This included soil makes up 15 percent of the total unit. All included soils have 0 to 2 percent slopes.

In a typical profile the surface layer is grayish brown loam 12 inches thick (fig. 7). The subsoil is dark yellowish brown silty clay loam 13 inches thick. The upper part of the substratum is pale brown loam and clay loam to a depth of 55 inches. This is underlain by light brownish gray loamy fine sand. The soil is calcareous and is strongly alkaline throughout. It is strongly affected by salinity and alkalinity.

Mottled colors are common in the substratum below 25 inches. The water table is between a depth of 18 and 36 inches for long periods during peak irrigation season. The soil is subject to common flooding for brief periods during spring.

Permeability is moderately slow. Effective rooting depth is 18 to 36 inches. Available water capacity is 2 to 4 inches. Surface runoff is slow, and the hazard of erosion is slight. The hazard of soil blowing is slight, except in the sandy loam and loamy sand areas where it is high.

This soil is used for range, intensive recreation areas, for example, a golf course, and occasionally for irrigated pasture. It has potential for recreation and for wildlife

habitat. Recreation areas should be protected, against flooding. Seeding of turf or cover must be of species that can tolerate wetness and the saline-alkali soil. Intensive management is necessary to maintain vegetation. Wildlife should be limited to wetland species.

Irrigation is generally flooding on borders. Nitrogen and phosphorous fertilizers are beneficial to pasture but in small amounts to minimize leaching losses. Irrigation should use large applications ponded on the surface to leach salt from the soil. The addition of gypsum is helpful in treating alkalinity.

This soil is adjacent to large bodies of water such as the Snake River. It could be an important feeding, nesting, and loafing area for waterfowl if shallow water areas are constructed and crops for feed are planted.

As range condition deteriorates, alkali sacaton, basin wildrye, and alkali bluegrass decrease and black greasewood and inland saltgrass increase. Range can be seeded if range condition is poor. Tall wheat grass, tall fescue, Garrison creeping foxtail, and birdsfoot trefoil are some of the plants suitable for reseeding. Fall seeding achieves the best results. Capability subclass VIw nonirrigated, and IIIw irrigated.

3-Alpowa loam, 1 to 3 percent slopes. This is a deep, well drained soil on alluvial fans. Elevation ranges from 4,300 to 5,000 feet. This soil formed in loess mixed with alluvium. Average annual precipitation is about 14 inches, average annual air temperature is about 48 degrees F, and the frost-free season is 110 to 130 days.

Included with this soil in mapping is Weeks loam, 1 to 3 percent slopes in small, protected pockets and Taunton loam, 2 to 4 percent slopes, near fan edges. These included soils each make up 5 percent of the total unit. Also included is Disautel loam, 1 to 3 percent slopes, in intermittent stream channels. This included soil makes up 10 percent of the total unit.

In a typical profile the surface layer is grayish brown and light brownish gray loam 10 inches thick. This is underlain by light brownish gray very gravelly loam and very cobbly loam to a depth of 60 inches. The soil is moderately alkaline and is calcareous. A concentration of lime is between a depth of 10 and 18 inches.

Permeability is moderately rapid. Effective rooting depth is 40 to 60 inches or more. Available water capacity is 3.75 to 5.0 inches. Surface runoff is slow, and the hazard of erosion is slight.

This soil is used for range and some nonirrigated crops such as wheat and barley. It has potential for irrigated farmland. Potential crops are barley, wheat, sugar beets, alfalfa hay, or pasture. Irrigation on this soil should be light and frequent to keep the rooting zone moist. Deep plowing should be avoided in this soil since this will bring gravel and cobble to the surface.

This soil is best suited to sprinkler irrigation, because surface irrigation requires leveling and causes an accumulation of cobbles and gravel on the surface.

The inclusion of small areas of soil along short breaks and along intermittent stream channels that support a few small trees and brush makes this area desirable for mule deer. This soil is also often fringed by areas that provide shelter for deer, so the deer can feed in this area without being too far from shelter. This area is important to many nongame birds and to chukar and quail, but it is too dry for pheasant or Hungarian partridge unless irrigation is added. Rangeland habitat should be improved.

As range condition deteriorates, bluebunch wheatgrass and Idaho fescue decrease and big sagebrush increases. Range can be seeded if range condition is poor. Bluebunch wheatgrass, pubescent wheatgrass, crested and Siberian wheatgrass, intermediate wheatgrass, alfalfa, and bitterbrush are some of the plants suitable for reseeding. The soil should be seeded late in fall or early in spring. Brush management is desirable if the amount of brush is excessive. Capability subclass VIs nonirrigated.

4-Alpowa loam, 3 to 12 percent slopes. This is a deep, well drained soil on alluvial fans. Elevation ranges from 4,500 to 5,800 feet. This soil formed in loess mixed with alluvium. Average annual precipitation is about 14 inches, average annual air temperature is about 48 degrees F, and the frost-free season is 100 to 130 days.

Included with this soil in mapping is Weeks loam, 3 to 7 percent slopes, in intermittent stream channels or on small fans; Taunton loam, 4 to 7 percent slopes, on sides of small ridges or on faces of fans; and Aysees gravelly loam, 1 to 12 percent slopes, along intermittent stream channels. These included soils each make up 5 percent of the total unit.

In a typical profile the surface layer is grayish brown loam 10 inches thick. This is underlain by pale brown cobbly loam, very cobbly loam, and very cobbly sandy loam to a depth of 60 inches. The soil is moderately alkaline and is noncalcareous to a depth of 12 inches. A concentration of lime is between a depth of 27 and 35 inches.

Permeability is moderately rapid. Effective rooting depth is 40 to 60 inches or more. Available water capacity is 4 to 5 inches. Surface runoff is medium, and the hazard of erosion is moderate.

This soil is used for range and for wildlife habitat. It also supplies runoff to lower areas. It has potential for irrigation, but it is limited by steep slopes and low available water capacity.

The inclusion of small areas of soil along short breaks and along stream channels that support a few small trees and brush make this area desirable for mule deer. This soil is often fringed by areas that provide deer shelter so the deer can feed in this map unit without being too far from shelter. This area is important to many nongame birds and to chukar, but it is too dry for pheasant or Hungarian partridge unless irrigation is added. Rangeland habitat should be improved.

As range condition deteriorates, bluebunch wheatgrass and Idaho fescue decrease and big sagebrush increases. Range can be seeded if range condition is poor. Bluebunch wheatgrass, pubescent wheatgrass, crested and Siberian wheatgrass, intermediate wheatgrass, alfal-

fa, and bitterbrush are some of the plants suitable for reseeding. The soil should be seeded late it fall or early in spring. Brush management is desirable if the amount of brush is excessive. Capability subclass VIs.

5-Alpowa loam, wet. This is a deep soil on alluvial fans and along stream channels. Slopes are 1 to 7 percent. Elevation ranges from 4,300 to 5,000 feet. This soil formed in alluvium derived from mixed sources. Average annual precipitation is about 13 inches, average annual air temperature is about 48 degrees F, and the frost-free season is 110 to 130 days.

Included with this soil in mapping are Goose Creek, wet, and Drax, wet, soils in more level areas and a soil similar to Alpowa loam in the area along Trapper Creek. The similar soil differs from Alpowa loam by having a water table between a depth of 10 and 30 inches. These included soils each make up 5 percent of the total unit. They have 1 to 3 percent slopes.

In a typical profile the surface layer is grayish brown and light brownish gray loam 10 inches thick. This is underlain by pale brown cobbly loam, very cobbly sandy loam, and very gravelly sandy loam to a depth of 60 inches. The soil is mildly alkaline and is noncalcareous.

This soil has an intermittent water table that rises to within 36 inches during spring and summer. This soil does not fit the range of the Alpowa series, but because of limited acreage and the same interpretation and use, is included with it. The soil is subject to occasional flooding late in spring.

Permeability is moderately rapid. Effective rooting depth is 40 to 60 inches or more. Available water capacity is 4 to 5 inches. In irrigated areas, surface runoff is medium or rapid and the hazard of erosion is moderate or high. Under natural conditions, surface runoff is slow and the hazard of erosion is slight. The hazard of soil blowing is slight.

This soil is used for irrigated farmland, wildlife habitat, and range. It has potential for recreation use but requires protection from flooding. Where this map unit is near major streams; camps, parks, or nature trails are good uses. Any use which disturbs the soil in the area should be carefully controlled to prevent stream pollution.

Irrigated crops are wheat, barley, sugar beets, hay, or pasture. All crops respond well to phosphorous fertilizer, and all crops except alfalfa respond to nitrogen fertilizer. Crop rotation should provide for a balance between such soil-depleting crops as sugar beets, and such soil-building crops as alfalfa. To maintain good soil tilth organic matter such as straw or manure should be returned to the soil. Deep plowing or excessive plowing should be avoided in this soil since this will bring gravel and cobbles to the surface.

This soil is best suited to sprinkler irrigation, because surface irrigation requires leveling and causes an accumulation of cobbles and gravel on the surface.

The inclusion of small areas of soil along stream channels that support small trees and brush make this area desirable for shelter and feed for mule deer. Other species of predators and game and nongame wildlife migrate to this area for water. This area is important to many nongame birds and to chukar, but it is too dry for pheasant or Hungarian partridge unless irrigation is added. Rangeland and openland habitat needs to be improved. Even though a water table and streams are present it would be difficult to develop wetland wildlife because of seasonal water variability and soil seepage.

As range condition deteriorates, bluebunch wheatgrass and Idaho fescue decrease and big sagebrush increases. Range can be seeded if range condition is poor. Bluebunch wheatgrass, pubescent wheatgrass, crested and Siberian wheatgrass, intermediate wheatgrass, alfalfa, and bitterbrush are some of the plants suitable for reseeding. The soil should be seeded late in fall or early in spring. Brush management is desirable if the amount of brush is excessive. Capability subclass VIs nonirrigated and IVe irrigated.

6-Alpowa cobbly loam, 20 to 60 percent slopes. This is a deep, well drained soil on dissected alluvial fans. Elevation ranges from 4,800 to 5,800 feet. This soil formed in loess and alluvium derived from mixed sources. Average annual precipitation is about 14 inches, average annual air temperature is about 48 degrees F, and the frost-free season is 100 to 125 days.

Included with this soil in mapping is Disautel loam, 3 to 7 percent slopes, along intermittent stream channels; and cobbly loam, 20 to 60 percent slopes, that has a hardpan between a depth of 20 and 40 inches, on fan breaks. These included soils each make up 5 percent of the total unit.

In a typical profile the surface layer is grayish brown and brown cobbly loam 7 inches thick. This is underlain by light brownish gray, very pale brown, and white very gravelly loam and very cobbly loam to a depth of 60 inches. The soil is moderately alkaline and is calcareous. A concentration of lime is between a depth of 16 and 30 inches.

Permeability is moderately rapid. Effective rooting depth is 40 to 60 inches or more. Available water capacity is 4 to 5 inches. Surface runoff is very rapid, and the hazard of erosion is very high. The hazard of soil blowing is slight.

This soil is used for range and for wildlife habitat. It also supplies runoff to lower adjacent areas.

The inclusion of small pockets of aspen and brushy areas on this soil makes it highly desirable for mule deer. Steep slopes prevent wetland development. This area is important to chukar and some nongame birds but is undesirable for pheasant because of the lack of cropland. Habitat improvement would be limited to rangeland practices.

As range condition deteriorates, bluebunch wheatgrass and Idaho fescue decrease and big sagebrush increases. Range can be seeded by conventional methods on slopes that range to about 30 percent. Brush management is desirable if the amount of brush is excessive. Capability subclass VIIs.

7-Aysees gravelly loam, 1 to 12 percent slopes. This is a somewhat excessively drained soil on alluvial fans. Elevation ranges from 4,500 to 4,800 feet. This soil formed in mixed alluvium derived from quartz latite, volcanic tuff, and limestone with some loess influence. Average annual precipitation is about 8 inches, average annual air temperature is about 50 degrees F, and the frost-free season is 110 to 130 days.

Included with this soil in mapping is Paniogue loam that has 2 to 4 percent slopes and Declo loam, 3 to 7 percent slopes. These included soils are along intermittent stream channels. Paniogue loam makes up 10 percent of the total unit, and Declo loam makes up 5 percent.

In a typical profile the surface layer is light brownish gray and light gray gravelly loam and gravelly clay loam 6 inches thick. This is underlain by very pale brown very gravelly sandy loam, very gravelly loamy coarse sand, and very gravelly coarse sand to a depth of 60 inches. A layer of strong lime accumulation is between a depth of 6 and 21 inches. The soil is moderately alkaline and strongly alkaline.

Permeability is moderately rapid. Effective rooting depth is more than 60 inches. There is some root restriction because of droughtiness and occasional weak cementation below a depth of 6 inches. Available water capacity is less than 2.5 inches. Under natural conditions, surface runoff is slow or medium and the hazard of erosion is slight or moderate. In irrigated areas, surface runoff is medium or rapid and the hazard of erosion is moderate or high. The hazard of soil blowing is slight.

This soil is used for range, wildlife habitat, and small areas of irrigated crops. It has potential for additional acres to be used as irrigated cropland. Sprinklers are the most suitable method of irrigation. Because of low available water capacity and fast water intake, irrigation must be frequent with small amounts applied.

Crops are wheat, barley, potatoes, pasture, and alfalfa hay. All crops except alfalfa respond to nitrogen fertilizer. Phosphorous fertilizer is beneficial to all crops, particularly alfalfa. To maintain good soil tilth it is necessary to add manure or crop residue to other fertilizers. Crop rotation should provide for a balance between such soil-depleting crops as small grains with the residue removed, and such soil-building crops as alfalfa.

This soil is best suited to sprinkler irrigation although most other methods can be used. Because of the underlying coarse material, this soil must be irrigated in such a way that the soil above this material is filled without loss due to deep percolation. Frequent irrigation is necessary to minimize the effect that the low water-holding capacity has on the crop. Surface irrigation systems should be designed so that land leveling cuts are less than half the depth of the soil over gravel and sand.

The association of small pockets of brushy areas in the adjoining Mackey-Rock outcrop complex areas makes this soil desirable for mule deer feeding. Soil seepage makes wetland development impractical. This area is important to chukar, quail, and some nongame birds but is undesirable for pheasant because of the lack of cropland. As more cropland is developed, pheasant could become important to the area. Habitat improvement would be limited to openland and rangeland practices.

As range condition deteriorates, bluebunch wheatgrass and Thurber needlegrass decrease and sagebrush increases. If deterioration continues, weedy annuals will invade. The best method to improve range condition is through grazing management. There is a very high risk that seeding will fail because of droughtiness. Siberian and crested wheatgrass, Russian wildrye, and bluebunch wheatgrass are some adapted plants suitable for reseeding. Seeding achieves the best results late in fall. Capability subclass IVe nonirrigated, and VIIe irrigated.

8-Bedke silt loam, 1 to 3 percent slopes. This is a deep, well drained soil on terraces and alluvial fans (fig. 8). Elevation ranges from 4,500 to 5,500 feet. This soil formed in loess and underlying alluvium and colluvium. Average annual precipitation is about 13 inches, average annual air temperature is about 48 degrees F, and the frost-free season is 100 to 120 days.

Included with this soil in mapping is a soil similar to Bedke silt loam, 1 to 3 percent slopes, that is strongly alkaline in the surface layer and subsoil. This included soil makes up about 10 percent of the total unit. Also included are small areas of Taunton loam on tops of terraces and Alpowa loam along intermittent stream channels. These soils have 1 to 3 percent slopes.

In a typical profile the surface layer is pale brown silt loam 8 inches thick. The subsoil is brown and light yellowish brown silty clay loam and silt loam 13 inches thick. The substratum is very pale brown and light gray loam to a depth of 60 inches. The soil is noncalcareous to a depth of 18 inches. A layer of lime accumulation and weak silica cementation is between a depth of 21 and 37 inches. The soil is neutral or mildly alkaline to a depth of 18 inches and strongly alkaline below this.

Permeability is moderately slow. Effective rooting depth is 60 inches or more. There is some root restriction at a depth of 21 inches because of cementation. Available water capacity is 8 to 10 inches. Surface runoff is slow, and the hazard of erosion is moderate. The hazard of soil blowing is slight.

This soil is used for wildlife habitat, irrigated and nonirrigated crops and range. Irrigated crops are alfalfa, pasture, sugar beets, potatoes, wheat, and barley. All irrigated crops respond well to fertilization. To maintain good soil tilth, crops should be rotated and organic matter should be returned to the soil.

This soil is suited to sprinkler, furrow, corrugation, or border irrigation. Because of the moderately slow permeability water must be applied slowly. Moving sprinklers is difficult because of the muddy conditions in a recently watered area.

Fall wheat is grown on nonirrigated cropland. This soil needs a cover of crop stubble or other kinds of organic matter if it is not protected. When cropped this soil should be tilled only as much as necessary to seed and

establish the crop. All tillage operations should be across the slope. The soil should be left idle in alternate years to conserve moisture. Wheat responds well to nitrogen fertilizer, but care must be used to apply a controlled amount. Excess nitrogen causes excess use of the limited available moisture.

In irrigated areas, this soil is well suited to habitat for ring-necked pheasant, Hungarian partridge, mourning dove, and nongame birds. Openland habitat can be improved by leaving grassland undisturbed and by planting shrubs and trees for nesting sites and cover. Unharvested crops furnish feed. If this soil is not irrigated, it supports a limited number of upland birds and cottontail. Many mourning doves use areas of this soil during migration. This area is an important winter range for mule deer. Proper grazing use by livestock and restricted brush control are beneficial to the deer.

As range condition deteriorates, wheatgrasses decrease and sagebrush and other less desirable plants increase. Weeds and other undesirable plants invade. Range can be reseeded with adapted grasses if range condition is poor. Fall seeding achieves the best results. Whitmar bluebunch wheatgrass, pubescent wheatgrass, intermediate wheatgrass, alfalfa, and bitterbrush are some adapted plants suitable for reseeding. Brush. management is desirable if the amount of brush is excessive. Capability subclass IIIc nonirrigated and IIe irrigated.

9-Bedke silt loam, 3 to 12 percent slopes. This is a deep, well drained soil on terraces and alluvial fans (fig. 8). Elevation ranges from 5,000 to 6,000 feet. This soil formed in loess and underlying alluvium and colluvium. Average annual precipitation is about 13 inches, average annual air temperature is about 48 degrees F, and the frost-free season is 100 to 120 days.

Included with this soil in mapping is a soil similar to Bedke silt loam, 3 to 12 percent slopes, that is strongly alkaline in the surface layer and subsoil. This included soil makes up about 10 percent of the total unit. Also included are small areas of Taunton loam, 4 to 7 percent slopes, on tops of terraces, and Alpowa loam, 3 to 12 percent slopes, along ephemeral stream channels.

In a typical profile the surface layer is pale brown silt loam 8 inches thick. The subsoil is brown and light yellowish brown silty clay loam and silt loam 13 inches thick. The substratum is very pale brown and light gray loam to a depth of 60 inches. The soil is noncalcareous to a depth of 18 inches. A layer of lime accumulation anal weak silica cementation is between a depth of 21 and 37 inches. The soil is neutral or mildly alkaline to a depth of 18 inches and strongly alkaline below this.

Permeability is moderately slow. Effective rooting depth is 60 inches or more. There is some root restriction at a depth of 21 inches because of cementation. Available water capacity is 8 to 10 inches. Surface runoff is medium, and the hazard of erosion is moderate. The hazard of soil blowing is slight.

This soil is used for range, wildlife habitat, and nonirrigated crops. It has potential for irrigated crops.

Slope must be considered if the soil is to be irrigated. Fall wheat is grown on nonirrigated cropland. If this soil is not protected, it needs a cover of crop stubble or other kinds of organic matter. This soil should be tilled only as much as necessary to seed and establish the crop. All tillage operations should be across the slope. This soil should be kept fallow in alternate years to conserve moisture. Fall wheat responds well to nitrogen fertilizer, but care must be taken to apply a controlled amount. The application of too much nitrogen causes excess use of the limited available moisture.

This soil supports a limited number of upland birds and cottontail. Many mourning doves use areas of this soil during migration. This soil is an important winter range for mule deer. Proper grazing use by livestock and restricted brush control are beneficial to deer. Openland habitat can be improved by leaving grassland undisturbed and by planting shrubs and trees for nesting sites and cover. Unharvested crops furnish feed.

As range condition deteriorates, wheatgrasses decrease and sagebrush and other less desirable plants increase. Weeds and other undesirable plants invade. Range can be seeded with adapted grasses if range condition is poor. Fall seeding achieves the best results. Whitmar bluebunch wheatgrass, pubescent wheatgrass, intermediate wheatgrass, alfalfa, and bitterbrush are some adapted plants suitable for reseeding. Brush management is desirable if the amount of brush is excessive. Capability subclass IIIe nonirrigated and IVe irrigated.

10-Beetville loam. This is a deep, moderately well drained, nearly level soil on low terraces and valley bottoms along stream channels. Elevation ranges from 4,150 to 4,800 feet. This soil formed in alluvium derived from mixed sources. Average annual precipitation is about 10 inches, average annual air temperature is about 49 degrees F, and the frost-free season is 110 to 140 days.

Included with this soil in mapping is a soil similar to the Beetville soil that has a sandy loam surface layer. Also included are Goose Creek silt loam and Drax silt loam in depressions and Paniogue loam and small areas of Quincy loamy sand in old channels on gravel or sand bars. These included areas have slopes of 0 to 2 percent. They make up 5 percent of the total unit.

In a typical profile the surface layer is grayish brown loam 13 inches thick. This is underlain by light brownish gray loam and fine sandy loam to a depth of 49 inches. The next layer is light brownish gray loamy sand. The soil is moderately alkaline. It is noncalcareous to a depth of 33 inches and slightly calcareous below this.

Originally, a water table fluctuated to within 30 to 50 inches of the surface for brief periods. Because of water impoundments, this area no longer has a water table above 50 inches except in dry years when excessive irrigation is used. Areas along Goose Creek and Cottonwood Creek are still affected by a water table.

Permeability is moderate. Effective rooting depth is 40 to 60 inches or more. Available water capacity is 7.5 to 9 inches. Surface runoff is very slow. The hazards of ero-

sion and soil blowing are slight, except in the included Beetville sandy loam areas where the hazard of soil blowing is moderate.

This soil is used for irrigated crops and for wildlife habitat. Crops are dry beans, potatoes, wheat, barley, sugar beets, pasture and alfalfa hay. All crops, except alfalfa, respond to nitrogen and phosphorous fertilizers. Alfalfa responds only to phosphorous fertilizer. To maintain good soil tilth, a balance must be provided between such soil-depleting crops as sugar beets and potatoes and such soil-building crops as alfalfa. It is also important to return organic matter to the soil in the form of manure or crop residue.

Irrigation methods suited to this soil are sprinkler, border, corrugation, and furrow. It is important not to apply more water to this soil than is needed. This will aggravate the water table and could cause the leaching of nutrients into the ground water where they become pollutants.

This soil is suited to habitat for ring-necked pheasant, Hungarian partridge, mourning dove, and nongame birds. Openland habitat can be improved or maintained for these animals by leaving grasslands undisturbed for nesting sites, by leaving unharvested grain crops for food, and by planting trees and shrubs where winter cover is needed. This soil can support most kinds of wildlife conducive to openland. Rangeland wildlife would be limited by size of units. Wetland wildlife is limited by water seepage and would have an adverse effect in surrounding areas.

Homes are built on this soil in rural areas. Homes, roads, or other construction should be protected from the hazard of rare flooding. Houses with basements should be built in areas where the water table has been lowered. Excavation should be limited to a depth of about 24 inches. Septic tanks should be designed to avoid contamination of ground water. Capability subclass IIc irrigated.

11-Bram silt loam. This is a deep, moderately well drained, nearly level soil on low terraces and alluvial fans. Elevation ranges from 4,300 to 4,800 feet. This soil formed in alluvium derived from mixed sources. Average annual precipitation is about 9 inches, average annual air temperature is about 49 degrees F, and the frost-free season is 100 to 140 days.

Included with this soil in mapping is strongly saline-alkali affected clay or clay loam in old channel oxbows or depressions. This included soil makes up about 10 percent of the total unit.

In a typical profile the surface layer is light brownish gray silt loam 4 inches thick. This is underlain by light gray, light brownish gray, or very pale brown silt loam to a depth of 52 inches. The next layer is gravelly loam to a depth of 60 inches or more. The soil is very strongly alkaline and is calcareous. A concentration of lime is between a depth of 4 and 30 inches. The soil has mottles below a depth of 41 inches.

A water table is between a depth of 36 and 60 inches for 1 to 3 months in most years. The soil is strongly affected by salts.

Permeability is moderately slow. Effective rooting depth is 40 to 60 inches. Available water capacity is 2.5 to 4.0 inches. Surface runoff is slow, and the hazards of erosion and soil blowing are slight.

This soil is used for wildlife habitat, for range, and for limited irrigated crops.

Irrigated farmland is generally cropped to sugar beets, alfalfa hay, or barley. Additions of sulfur to lower the pH of the soil have shown some short-term benefits to cropping, but the drainage needed to properly leach this soil is hampered because of lack of outlets. The best suited irrigated crop for this soil is salt-tolerant pasture.

Irrigation methods suited to this soil are border, furrow, corrugation, and sprinkler. Leaching irrigations are needed to remove the salt from the soil, however, these tend to aggravate the water table.

Under natural conditions, this soil furnishes a source of cover and nesting sites for upland game bird wildlife. If this soil is cultivated, unharvested crops are a food source. Because of severe salinity and alkali problems it is difficult to manage for vegetation other than salt-tolerant species. Openland wildlife is the best suited use of this area.

As range condition deteriorates, alkali sacaton, dropseed, basin wildrye, and alkali bluegrass decrease and black greasewood and inland saltgrass increase. The best method of improving range condition is through grazing management. There is a very high risk that seeding will fail because of the saline and alkaline soil condition. Tall wheatgrass, tall fescue, Garrison creeping foxtail, and birdsfoot trefoil are some of the plants suitable for reseeding. Fall seeding achieves the best results. Capability subclass VIIs nonirrigated and IVw irrigated.

12-Buko-Paniogue complex. The soils in this unit are on stream terraces. Elevation ranges from 4,100 to 4,600 feet. Buko loam that has slopes of 0 to 2 percent makes up 50 percent of this unit. Paniogue loam that also has slopes of 0 to 2 percent makes up 35 percent. The pattern of occurrence is complex and difficult to detect without examining the prunes of the soils. Average annual precipitation is about 10 inches, average annual air temperature is about 49 degrees F, and the frost-free season is 110 to 140 days.

The rest of this unit is a soil similar to the Paniogue soil, along recent channels, except it is gravelly sandy loam above the gravel and sand layer. This soil makes up about 10 percent of the map unit. Also included are Paulville clay loam, Garbutt silt loam, and Weeks loam in pockets of deep soil on broad terrace tops. These included soils have slopes of 0 to 2 percent and make up 5 percent of the unit.

The Buko soil is deep and well drained and formed in mixed stream sediment. In a typical profile the surface layer is brown loam 10 inches thick. The subsoil is pale brown loam and clay loam 10 inches thick. The next layer

is pale brown loam and silt loam to a depth of 34 inches. This is underlain by pale brown very gravelly loamy sand to a depth of 60 inches. The soil is moderately alkaline and is noncalcareous to a depth of 20 inches. A layer of lime accumulation is between a depth of 20 and 34 inches. Weak silica cementation and hard nodules are between a depth of 14 and 28 inches.

Permeability is moderately slow. Effective rooting depth is 20 to 40 inches. Available water capacity is 2.5 to 5.0 inches. Surface runoff is slow, and the hazards of erosion and soil blowing are slight.

The Paniogue soil is deep and well drained and formed in mixed stream sediment. In a typical profile the surface layer is pale brown loam 9 inches thick. The subsoil is also pale brown loam 9 inches thick. The next layer is pale brown loam and gravelly sandy loam to a depth of 32 inches. This is underlain by sand and gravel to a depth of 60 inches. A layer of lime accumulation :is between a depth of 18 and 32 inches.

Permeability is moderate. Effective rooting depth is 20 to 40 inches. Available water capacity is 2.5 to 5.0 inches. Surface runoff is slow, and the hazards of erosion and soil blowing are slight.

Buko and Paniogue soils are used for wildlife habitat, for urban development, for irrigated crops, for range, and as a source for gravel and sand.

Irrigated crops are wheat, barley, sugar beets, potatoes, dry beans, alfalfa hay, and pasture. Alfalfa responds to phosphorous fertilizer, and all other crops respond to both nitrogen and phosphorous fertilizers. To maintain good soil tilth, it is necessary to add manure or crop residue to other fertilizers. Crop rotation should provide for a balance between such soil-depleting crops as potatoes, and such soil-building crops as alfalfa.

These soils are suited to corrugation, border, furrow, or sprinkler irrigation. Because of the underlying coarse material, these soils must be irrigated in such a way that the soil above this material is filled without causing losses because of deep percolation. Irrigation on deeper soils should be more frequent.

If these soils are irrigated, they are well suited to habitat for ring-necked pheasant, Hungarian partridge, mourning dove, and nongame birds. Openland habitat can be improved by leaving grassland undisturbed and by planting shrubs and trees for nesting sites and cover. Unharvested crops furnish feed. If these soils are not irrigated, they support a limited number of upland birds and cottontail. These soils are mostly in intensively farmed areas which makes it difficult to manage for rangeland habitat because of the size of fields. In large areas, this map unit is good for winter range for mule deer. Proper grazing use by livestock and restricted brush control are beneficial to deer.

As range condition deteriorates, perennial, grasses and other desirable plants decrease and sagebrush increases. Range can be seeded if range condition is poor. Siberian and crested wheatgrass, Russian wildrye, and Whitmar bluebunch wheatgrass are some adapted plants suitable for reseeding. There is a moderate to high chance that seeding will fail because of droughtiness. Fall seeding achieves the best. results. Brush management is desirable if the amount of brush is excessive.

These soils have been used for homesites. Most homes are in rural areas, but there are some developments near the cities of Burley and Declo. For best results, foundations should be put in the coarse material between a depth of 20 and 40 inches. Septic tank drainage fields function well if placed in this coarse material, but there is a hazard of pollution from deep percolation. Where this soil is near drainage ditches or canals precaution is needed to prevent water from seeping into basements. Capability subclass VIe nonirrigated and IIIs irrigated.

13-Buko-Paniogue complex, wet. The soils in this unit are on stream terraces. Elevation ranges from 4,100 to 4,600 feet. Buko loam, wet, that has slopes of 0 to 2 percent makes up 50 percent of this unit. Paniogue loam, wet, that also has slopes of 0 to 2 percent makes up 30 percent. The pattern of occurrence is complex and difficult to detect without examining the profiles of the soils. Average annual precipitation is about 10 inches, average annual air temperature is about 49 degrees F, and the frost-free season is 110 to 140 days.

The rest of this unit is Abo loam that has 0 to 2 percent slopes in depressions and Weeks loam, 1 to 3 percent slopes, on small ridges. These included soils each make up 5 percent of the map unit. Also included is a soil similar to Buko loam, 0 to 2 percent slopes, except it is saline and has water between a depth of 20 and 40 inches about half the time. This soil is along water channels and in depressions and makes up 10 percent of the unit.

The wet Buko soil is deep and has a water table because of irrigation in adjoining areas. It formed in mixed stream sediment. In a typical profile the surface layer is grayish brown loam 4 inches thick. The subsoil is light brownish gray loam 11 inches thick. The next layer is pale brown loam to a depth of 30 inches. This is underlain by very gravelly loamy sand to a depth of 60 inches. The soil is mildly alkaline or moderately alkaline. It was noncalcareous to a depth of 15 inches but has been recharged with lime by addition of calcareous water. It is now calcareous throughout. A layer of strong lime accumulation is between a depth of 15 and 30 inches. Either weak silica cementation or hard nodules is between a depth of 15 and 30 inches. The soil has a water table within a depth of 30 inches for brief periods but is below a depth of 48 inches most of the time.

Permeability is moderately slow. Effective rooting depth is 20 to 40 inches. Available water capacity is 2.5 to 5.0 inches. Surface runoff is slow, and the hazards of erosion and soil blowing are slight.

The wet Paniogue soil is deep and has a water table because of irrigation in adjoining areas. It formed in mixed stream sediment. In a typical profile the surface layer is grayish brown loam 6 inches thick. The subsoil is pale brown loam 6 inches thick. The next layer is very pale brown very fine sandy loam to a depth of 24 inches.

This is underlain by very gravelly loamy sand to a. depth of 60 inches. The soil is moderately alkaline and is noncalcareous to a depth of 12 inches. A layer of lime accumulation is between a depth of 12 and 24 inches. This soil has a water table below a depth of 48 inches most of the time but rises to within 30 inches of the surface during peak irrigation periods.

Permeability is moderate. Effective rooting depth is 20 to 40 inches. Available water capacity is 2.5 to 5.0 inches. Surface runoff is slow, and the hazards of erosion and soil blowing are slight.

These soils are used for wildlife habitat and for irrigated crops. Irrigated crops are wheat, barley, sugar beets, potatoes, dry beans, alfalfa hay, and pasture. Alfalfa responds to phosphorous fertilizer, and all other crops respond to both nitrogen and phosphorous fertilizers. To maintain good soil tilth, it is important to add manure or crop residue to the other fertilizers. Crop rotation should provide for a balance between such soil-depleting crops as potatoes, and such soil-building crops as alfalfa.

Irrigation methods suited to these soils are border, corrugation, furrow, or sprinkler. Because of the underlying coarse material this soil must be irrigated in such a way that the soil above this material is filled without causing losses due to deep percolation and aggravation of the water table. Irrigation on deeper soils should be more frequent.

Buko and Paniogue soils are suited to habitat for ring-necked pheasant, Hungarian partridge, mourning dove, and nongame birds. Openland habitat can be improved or maintained for these animals by leaving grasslands undisturbed for nesting sites, by leaving unharvested grain crops for food, and by planting trees anti shrubs where winter cover is needed.

These soils have been used for homesites, and most homes are in rural areas. Homes with basements need artificial drainage, or the bottom of the basement needs to be above a depth of 30 inches which is the depth to which the water table rises on infrequent occasions. The wetter areas should be avoided. For best results, foundations should be put in the coarse material between a depth of 20 and 40 inches. Septic tank drainage fields function well if placed in this coarse material, but there is a severe hazard of ground water pollution by the effluent. Capability subclass IIIs irrigated.

14-Declo sandy loam. This is a deep, well! drained, nearly level soil on broad valley terraces. Elevation ranges from 4,100 to 4,800 feet. This soil formed in alluvium and lake sediment derived from mixed sources. Average annual precipitation is about 9 inches., average annual air temperature is 49 degrees F, and the frost-free season is 110 to 140 days.

Included with this soil in mapping are Paulville clay loam, in small depressions or old playas, and Paniogue loam that has 0 to 2 percent slopes and Aysees gravelly loam, 1 to 12 percent slopes, in drainageways. These included soils each make up about 5 percent of the total unit.

In a typical profile the surface layer is light brownish gray and brown sandy loam 10 inches thick. This is underlain by very pale brown, light gray, and pale brown loam and very fine sandy loam to a depth of 60 inches. The soil is moderately alkaline and is calcareous. A layer of strong lime accumulation is below a depth of 16 inches.

Permeability is moderate. Effective rooting depth is 40 to 60 inches. Available water capacity is 7 to 9 inches. Surface runoff is slow. The hazard of erosion is slight, and the hazard of soil blowing is moderate.

This soil is used for irrigated crops and for wildlife habitat. Crops are dry beans, potatoes, wheat, barley, sugar beets, pasture, and alfalfa hay. Alfalfa responds to phosphorous fertilizer, and all other crops respond to both nitrogen and phosphorous fertilizers. To maintain good soil tilth, crop rotation should provide for a balance between such soil-depleting crops as sugar beets, and such soil-building crops as alfalfa. It is also important to return organic matter to the soil in the form of manure or crop residue.

Irrigation methods suited to this soil are border, corrugation, furrow, or sprinkler. It is important not to apply more water to this soil than is needed. This could aggravate the water table and cause leaching of nutrients into ground water where they become pollutants.

This soil is suited to habitat for ring-necked pheasant, Hungarian partridge, mourning dove, and nongame birds. Openland habitat can be improved or maintained for these animals by leaving grassland undisturbed for nesting sites, by leaving unharvested grain crops for food, and by planting trees and shrubs where winter cover is needed. This soil supports most species adapted to openland habitat. Rangeland wildlife is limited because of the lack of large range areas.

This soil is used for homesites in rural areas. Homes, roads, or other construction should be designed to overcome the low strength and the moderate potential frost action. Capability subclass IIe irrigated.

15-Declo loam, 0 to 1 percent slopes. This is a deep, well drained soil on broad valley terraces. Elevation ranges from 4,100 to 4,800 feet. This soil formed in alluvium and lake sediment derived from mixed sources. Average annual precipitation is about 9 inches, average annual air temperature is about 49 degrees F, and the frost-free season is 110 to 140 days.

Included with this soil in mapping is Paulville clay loam, Paniogue loam, and Garbutt silt loam. These soils have slopes of less than 1 percent, and each makes up 5 percent of the total unit.

In a typical profile the surface layer is light brownish gray loam 10 inches thick. This is underlain by light brownish gray, light gray, and pale brown loam, silt loam, and very fine sandy loam to a depth of 60 inches. The soil is moderately alkaline and is calcareous. A layer of strong lime accumulation is below a depth of 10 inches. In some places, the soil has gravelly sand below a depth of 40 inches. In other places, the soil is laminated below a depth of 25 inches. Where this soil is associated with Aysees,

Garbutt, or Brain soils the underlying soil is moderately alkaline or strongly alkaline.

Permeability is moderate. Effective rooting depth is 40 to 60 inches. Available water capacity is 7 to 9 inches. Surface runoff is slow, and the hazards of erosion and soil blowing are slight.

This soil is used for irrigated crops and for wildlife habitat. Crops are dry beans, potatoes, wheat, barley, sugar beets, pasture, and alfalfa hay. Alfalfa responds to phosphorous fertilizer, and all other crops respond to both nitrogen and phosphorous fertilizers. To maintain good soil tilth, crop rotation should provide for a balance between such soil-depleting crops as sugar beets, and such soil-building crops as alfalfa. It is also important to return organic matter to the soil in the form of manure or crop residue.

Irrigation methods suited to this soil are border, corrugation, furrow, or sprinkler. It is important not to apply more water to this soil than is needed. This could aggravate the water table and cause leaching, of nutrients into the ground water where they become pollutants.

This soil is suited to habitat for ring-necked pheasant, Hungarian partridge, mourning dove, and nongame birds. Habitat can be improved or maintained for these animals by leaving grassland undisturbed for nesting sites, by leaving unharvested grain crops for food, and by planting trees and shrubs where winter cover is needed.

Homes are built on this soil in rural areas and in subdivisions around Burley. Homes, roads, or other construction should be designed to overcome the low strength and the moderate potential frost action. Capability subclass IIc irrigated.

16-Declo loam, 1 to 3 percent slopes. This is a deep, well drained soil on broad valley terraces. Elevation ranges from 4,200 to 4,800 feet. This soil formed in alluvium and lake sediment derived from mixed sources. Average annual precipitation is about 9 inches, average annual air temperature is about 49 degrees F, and the frost-free season is 110 to 140 days.

Included with this soil in mapping is Paulville clay loam, on small playas, Garbutt silt loam on terraces with Declo soils, and Aysees gravelly loam and Paniogue loam in old stream channels. These included soils have slopes of 1 to 3 percent, and each makes up about 5 percent of the total map unit.

In a typical profile the surface layer is light brownish gray and pale brown loam 10 inches thick. This is underlain by light gray, white, and pale brown wilt loam and very fine sandy loam to a depth of 60 inches. The soil is calcareous. A layer of strong lime accumulation is below a depth of 14 inches. The soil is moderately alkaline to a depth of 44 inches and, is strongly alkaline below that. In some areas, the soil has gravelly sand below a depth of 40 inches.

Permeability is moderate. Effective rooting depth is 40 to 60 inches. Available water capacity is 7 to 9 inches. If the soil is irrigated, surface runoff is medium and the hazard of erosion is moderate. Under natural conditions, runoff is slow and the hazard of erosion is slight. The hazard of soil blowing is slight.

This soil is used for irrigated crops and for wildlife habitat. Crops are dry beans, potatoes, wheat, barley, sugar beets, pasture, and alfalfa hay. Alfalfa responds to phosphorous fertilizer, and all other crops respond to both nitrogen and phosphorous fertilizers. To maintain good soil tilth, crop rotation should provide for a balance between such soil-depleting crops as sugar beets, with such soil-building crops as alfalfa. It is also important to return organic matter to the soil in the form of manure or crop residue.

Irrigation methods suited to this soil are sprinkler, furrow, border, or corrugation. It is important not to apply more water to this soil than is needed. This could aggravate the water table and cause leaching of nutrients into the ground water where they become pollutants. Irrigation water should be applied at a rate that will not cause accelerated erosion and that is based on permeability and slope of the soil.

This soil is suited to habitat for ring-necked pheasant, Hungarian partridge, mourning dove, and nongame birds. Habitat can be improved or maintained for these animals by leaving grassland undisturbed for nesting sites, by leaving unharvested grain crops for food, and by planting trees and shrubs where winter cover is needed.

This soil is used for homesites in rural areas and in subdivisions around Burley. Homes, roads, or other construction should be designed to overcome the low strength and the moderate potential frost action. Capability subclass IIe irrigated.

17-Declo loam, 3 to 7 percent slopes. This is a deep, well drained soil on dissected, broad valley terraces. Elevation ranges from 4,300 to 4,800 feet. This soil formed in alluvium derived from mixed sources. Average annual precipitation is about 9 inches, average annual air temperature is about 49 degrees F, and the frost-free season is 110 to 140 days.

Included with this soil in mapping is Paniogue loam that has slopes of 3 to 7 percent, in old drainage channels and a soil similar to the Declo soil except it is gravelly and is strongly saline-alkali affected, near Cottonwood Creek and Dry Creek. These included soils each make up about 5 percent of the total map unit.

In a typical profile the surface layer is light brownish gray loam 10 inches thick. This is underlain by light brownish gray, light gray, and pale brown loam and silt loam to a depth of 60 inches. The soil is moderately alkaline or strongly alkaline and is calcareous. A layer of strong lime accumulation is below a depth of 10 inches.

Permeability is moderate. Effective rooting depth is 40 to 60 inches. Available water capacity is 7 to 9 inches. If the soil is irrigated, surface runoff is rapid and the hazard of erosion is high. Under natural conditions, surface runoff is medium and the hazard of erosion is moderate. The hazard of soil blowing is slight.

This soil is used for irrigated crops, wildlife habitat, and range. Crops are dry beans, potatoes, wheat, barley,

sugar beets, pasture, and alfalfa hay. Alfalfa responds to phosphorous fertilizer, and all other crops respond to both nitrogen and phosphorous fertilizers. To maintain good soil tilth, crop rotation should provide for a balance between such soil-depleting crops as sugar beets, and such soil-building crops as alfalfa. It is also important to return organic matter to the soil in the form of manure or crop residue.

Irrigation methods suited to this soil are sprinkler, furrow, border, and corrugation. Because of the slope, corrugations must be used with borders. It is important not to apply more water to this soil than is needed. This could aggravate the water table and cause leaching of nutrients into the ground water where they become pollutants. Irrigation water should be applied at a rate that will not cause erosion and that is based on slope and permeability of the soil.

If this soil is irrigated, it is well suited to habitat for ring-necked pheasant, Hungarian partridge, mourning dove, and nongame birds. Openland habitat can be improved by leaving grassland undisturbed and by planting shrubs and trees for nesting sites and cover. Unharvested crops furnish feed. Where this soil is not irrigated, it supports a limited number of upland birds and cottontail. Many mourning doves use areas of this soil during migration. This soil is an important winter range for mule deer where it is near areas that furnish cover and shelter. Proper grazing use by livestock and restricted brush control are beneficial to deer.

As range condition deteriorates, perennial grasses and other desirable plants decrease and sagebrush increases. Range can be reseeded if range condition is poor. Siberian and crested wheatgrass, Russian wildrye, and Whitmar bluebunch wheatgrass are some adapted plants suitable for reseeding. There is a moderate to high chance that seeding will fail because of droughtiness. Fall seeding achieves the best results. Brush management is desirable if the amount of brush is excessive. Capability subclass VIe nonirrigated and IIIe irrigated.

18-Disautel loam, 1 to 3 percent slopes. This is a deep, well drained soil on broad drainageways (fig. 9). Elevation ranges from 4,300 to 5,500 feet. This soil formed in alluvium derived from mixed sources. Average annual precipitation is about 13 inches, average annual air temperature is about 48 degrees F, and the frost-free season is 110 to 125 days.

Included with this soil in mapping is Alpowa loam and Goose Creek silt loam in drainageways and Weeks loam at a lower elevation. These included soils have slopes of 1 to 3 percent, and each makes up 5 percent of the total map unit.

In a typical profile the surface layer is brown loam 4 inches thick. The subsoil is brown and pale brown loam and silt loam 20 inches thick. This is underlain by pale brown and very pale brown loam, very fine sandy loam, and sandy loam to a depth of 60 inches. The soil is moderately alkaline; one layer below a depth of 42 inches is strongly alkaline. The soil is noncalcareous to a depth of 24 inches and is calcareous below that.

Permeability is moderate. Effective rooting depth is 60 inches or more. Available water capacity is 7.5 to 9.5 inches. If the soil is irrigated, surface runoff is medium and the hazard of erosion is moderate. Under natural conditions, runoff is slow and the hazard of erosion is slight. The hazard of soil blowing is slight.

This soil is used for irrigated and nonirrigated crops and for wildlife habitat. The nonirrigated crops are grown at a higher elevation to take advantage of higher precipitation. Irrigated crops are alfalfa, pasture, potatoes, sugar beets, wheat, and barley. Alfalfa responds to phosphorous fertilizer, and all other crops respond well to both nitrogen and phosphorous fertilizers. To maintain the continued productivity of this soil, crop rotation should provide for a balance between such soil-depleting crops as sugar beets, and such soil-building crops as alfalfa. Crop residue such as straw or manure should be returned to the soil to improve soil tilth.

Irrigation methods suited to this soil are border, furrow, corrugation, and sprinkler. The system used should be designed so that the water enters the soil with a minimum flow over the surface. Large surface flows cause accelerated erosion on this soil.

Nonirrigated crops are barley and wheat. These crops respond to nitrogen and phosphorous fertilizers applied in low rates because of low soil moisture. To maintain good tilth, it is important to return crop residue to the soil. Crop stubble should be left on these fields to conserve moisture and protect the surface. Nonirrigated cropland is generally left idle in alternate years to store moisture for the following year's crop.

If this soil is irrigated, it is well suited to habitat for ring-necked pheasant, Hungarian partridge, mourning dove, and nongame birds. Openland habitat can be improved by leaving grassland undisturbed and by planting shrubs and trees for nesting sites and cover. Unharvested crops furnish feed. Where this soil is not irrigated, it supports a limited number of upland birds and cottontail. Many mourning doves use areas of this soil during migration. This soil is an important winter range for mule deer. Proper grazing use by livestock and restricted brush control are beneficial to deer.

This soil is used for roads and for foundations for buildings in a few areas. These projects should be designed to allow for low strength and moderate potential frost action. Capability subclass IIIc nonirrigated and IIe irrigated.

19-Disautel loam, 3 to 7 percent slopes. This is a deep, well drained soil on broad drainageways. Elevation ranges from 4,400 to 5,500 feet. This soil formed in alluvium derived from mixed sources (fig. 9). Average annual precipitation is about 13 inches, average annual air temperature is about 47 degrees F, and the frost-free season is 110 to 125 days.

Included with this soil in mapping is about 10 percent Alpowa loam, 3 to 12 percent slopes, in steeper drainageways; 5 percent of a soil similar to Goose Creek silt loam that has 0 to 1 percent slopes, except it is poorly

drained and subject to flooding, and is in drainageways; and about 5 percent Weeks loam, 3 to 7 percent slopes, at lower elevations.

In a typical profile the surface layer is dark grayish brown loam 13 inches thick. The subsoil is brown and pale brown loam and silt loam 11 inches thick. This is underlain by light grayish brown and light gray loam and silt loam to a depth of 60 inches. The soil is moderately alkaline. It is slightly calcareous to a depth of 10 inches and is moderately calcareous below that.

Permeability is moderate. Effective rooting depth is 60 inches or more. Available water capacity is 7.5 to 9.5 inches. If this soil is irrigated, surface runoff is rapid and the hazard of erosion is high. Under natural conditions, runoff is medium and the hazard of erosion is moderate. The hazard of soil blowing is slight.

This soil is used for irrigated and nonirrigated crops and for wildlife habitat. Irrigated crops are alfalfa hay, pasture, potatoes, sugar beets, barley, and wheat. Alfalfa responds to phosphorous fertilizer, and all other crops respond well to both nitrogen and phosphorous fertilizers. To maintain the continued productivity of this soil, crop rotation should provide for a balance between such soildepleting crops as sugar beets, and such soil-building crops as alfalfa. Crop residue such as straw or manure should be returned to the soil to improve soil tilth.

Irrigation methods suited to this soil are border, furrow, corrugation, and sprinkler. Because of the slope, corrugations must be used with borders. Irrigation water should be applied at a rate that will not cause accelerated erosion and that is based on permeability and slope of the soil. If surface systems are used, it is important to irrigate across the slope. Sprinkler irrigation is well suited to this soil, and it can be used without extensive reshaping of the surface.

Nonirrigated crops are barley or wheat. 'These crops respond to nitrogen and phosphorous fertilizers applied in low rates because of low soil moisture. To maintain good tilth, it is important to return crop residue to the soil. Crop stubble should be left on these fields to conserve moisture and protect the surface soil. Nonirrigated cropland is generally left idle in alternate years to store moisture for the following year's crop. Cropping is carried out so plow lines and drill rows are across the slope to catch runoff water and prevent erosion.

If this soil is irrigated, it is well suited to habitat for ring-necked pheasant, Hungarian partridge, mourning dove, and nongame birds. Openland habitat can be improved by leaving grassland undisturbed, and by planting shrubs and trees for nesting sites and cover. Unharvested crops furnish feed. Where this soil is not irrigated, it supports a limited number of upland birds and cottontail. Many mourning doves use areas of this soil during migration. This soil is an important winter range for mule deer. Proper grazing use by livestock and restricted brush control are beneficial to deer.

This soil is used for roads and for foundations for buildings in a few areas. These projects should be designed to compensate for low strength and moderate potential frost action. Capability subclass IIIe nonirrigated and irrigated.

20-Drax silt loam. This is a deep, moderately well drained, nearly level soil on broad valley bottoms. Elevation ranges from 4,100 to 4,800 feet. This soil formed in alluvium derived from metamorphic and igneous rocks and loess. Average annual precipitation is about 9 inches, average annual air temperature is about 49 degrees F, and the frost-free season is 110 to 140 days.

Included with this soil in mapping is Goose Creek silt loam and Beetville loam. These soils each make up 10 percent of the total unit. Also included is a soil similar to the Drax soil, mostly along ditches and near canals, and has a water table between a depth of 20 and 40 inches. This soil makes up 5 percent of the unit. There is no pattern of occurrence for these included soils, which have slopes of 0 to 2 percent.

In a typical profile the surface layer is grayish brown silt loam 14 inches thick. This is underlain by light brownish gray and dark gray silt loam and silty clay loam to a depth of 60 inches. The soil is moderately alkaline. It is noncalcareous to a depth of 21 inches and is slightly calcareous and noncalcareous below that.

Originally these soils had a water table that would rise to within 30 inches of the surface during wet seasons in most years but because of the development and diversion of water sources the present water table is below 48 inches. During extremely dry years, when irrigation is excessive, the water table may rise to within 20 inches in some areas.

Permeability is moderate. Effective rooting depth is 60 inches or more. Available water capacity is 8.5 to 12 inches. Surface runoff is slow and the hazards of erosion and soil blowing are slight.

This soil is used for wildlife habitat, irrigated crops, and some residential uses on farm lots and near the town of Oakley. Irrigated crops are dry beans, sugar beets, potatoes, corn silage, alfalfa hay, wheat, and barley. Alfalfa responds to phosphorous fertilizer, and all other crops respond well to both nitrogen and phosphorous fertilizers. Crop rotation should provide for a balance between such soil-depleting crops as sugar beets, and such soil-building crops as alfalfa. Organic matter needs to be returned to the soil in the form of crop residue or manure.

Irrigation systems suited to this soil are border, furrow, corrugation, and sprinkler. The system used should be designed to replenish the moisture in the root zone without excessive surface runoff or deep percolation. Excessive deep percolation causes the water table to rise. Muddy conditions make sprinklers difficult to use.

This soil is suited to habitat for ring-necked pheasant, Hungarian partridge, mourning dove, and nongame birds. Openland habitat can be improved or maintained for these animals by leaving grassland undisturbed for nesting sites, by leaving unharvested grain crops for food, and by planting trees and shrubs where winter cover is needed.

This soil is used for homesites in rural areas and in the city of Oakley. For homes with basements, this soil should be investigated carefully since the introduced water sources or accumulation of water could cause the water table to rise to a hazardous level. Foundations should be built to allow for the moderate potential frost action, moderate shrink-swell potential, and the low strength. Capability subclass IIc irrigated.

21-Drax silt loam, wet. This is a deep, nearly level soil on broad valley bottoms. Elevation ranges from 4,200 to 4,600 feet. This soil formed in alluvium derived from metamorphic and igneous rocks and loess. Average annual precipitation is about 10 inches, average annual air temperature is about 49 degrees F, and the frost-free season is 110 to 140 days.

Included with this soil in mapping is Goose Creek silty clay loam, wet, and Wodskow sandy loam. There is no pattern of occurrence for these included soils. These included soils have 0 to 2 percent slopes, and each makes up 10 percent of the total map unit.

In a typical profile the surface layer is grayish brown silt loam 14 inches thick This is underlain by light brownish gray and dark gray silt loam and silty clay loam to a depth of 60 inches. The soil is moderately alkaline. It is noncalcareous to a depth of 21 inches and is slightly calcareous and noncalcareous below that. The soil has a water table that is within 30 inches of the surface for brief periods during wet seasons in most years.

Permeability is moderate. Effective rooting depth is 60 inches or more. Available water capacity is 8.5 to 12 inches. Surface runoff is slow, and the hazards of erosion and soil blowing are slight.

This soil is used for wildlife habitat, irrigated crops, and some residential uses on farm lots and near the city of Oakley. Irrigated crops are dry beans, sugar beets, potatoes, corn silage, alfalfa hay, wheat, and barley. Alfalfa responds to phosphorous fertilizer, and all other crops respond well to both nitrogen and phosphorous fertilizers. Crop rotation should provide for a balance between such soil-depleting crops as sugar beets, and such soil-building crops as alfalfa. Organic matter needs to be returned to the soil in the form of crop residue or manure.

'This soil is suited to most methods of irrigation especially border, furrow, corrugation, and sprinkler. The system used should be designed to replenish the moisture supply in the root zone without causing excessive surface runoff or deep percolation. Any percolation causes the water table to rise. Muddy conditions make sprinklers difficult to use.

This soil is suited to habitat for ring-necked pheasant, Hungarian partridge, mourning dove, and nongame birds. Openland habitat can be improved or maintained for these animals by leaving grassland undisturbed for nesting sites, by leaving unharvested grain crops for food, and by planting trees and shrubs where winter cover is needed. This soil can be used by waterfowl for feeding areas, and where desired, as shallow water areas constructed to provide nesting and loafing habitat.

This soil is used for homesites in rural areas and in the city of Oakley. For homes with basements, this soil should be artificially drained or basements should be excavated above 2 feet. Foundations should be built to allow for the moderate potential frost action, moderate shrink-swell potential, and the low strength. Capability subclass IIw irrigated.

22-Escalante sandy loam, **0 to 1 percent slopes.** This is a deep, well drained soil on broad valley terraces. Elevation ranges from 4,100 to 4,800 feet. This soil formed in alluvium and lake sediment derived from mixed sources. Average annual precipitation is about 9 inches, average annual air temperature is about 49 degrees F, and the frost-free season is 110 to 140 days.

Included with this soil in mapping is Paniogue loam, Declo sandy loam, and Escalante soil that has a loamy sand surface layer. These included soils have slopes of 0 to 2 percent and each makes up 5 percent of the total unit. There is no pattern of occurrence for the Declo and Paniogue soils. Escalante loamy sand is near blown out fields and fence lines. Also included are small areas of Escalante soils that have a water table because they are located near constructed drains, canals, or other wet soils.

In a typical profile the surface layer is light brownish gray sandy loam 5 inches thick. This is underlain by light brownish gray and light gray fine sandy loam to a depth of 47 inches. Below this is light brownish gray gravelly sand to a depth of 60 inches or more. The soil is moderately alkaline and calcareous. A layer of strong lime accumulation is between a depth of 12 and 24 inches.

Permeability is moderately rapid. Effective rooting depth is 40 to 60 inches or more. Available water capacity is 5 to 7 inches. Surface runoff is slow, the hazard of erosion is slight. The hazard of soil blowing is moderate.

This soil is used for irrigated crops, for wildlife habitat, and for limited residential use. Crops are dry beans, potatoes, wheat, barley, sugar beets, pasture, and alfalfa hay. Alfalfa responds to phosphorous fertilizer, and all other crops respond to both nitrogen and phosphorous fertilizers. To maintain good soil tilth, crop rotation should provide for a balance between such soil-depleting crops as sugar beets, and such soil-building crops as alfalfa. It is also important to return organic matter to the soil in the form of manure or crop residue. This soil needs a protective plant cover in spring to prevent soil blowing.

Irrigation methods suited to this soil are furrow, corrugation, border, and sprinkler. It is important not to apply more water to this soil than is needed. This could cause the water table to rise and also cause leaching of nutrients into the ground water where they become pollutants.

This soil is suited to habitat for ring-necked pheasant, Hungarian partridge, mourning dove, and nongame birds. Openland habitat can be improved or maintained for these animals by leaving grassland undisturbed for nesting sites, by leaving unharvested grain crops for food, and by planting trees and shrubs where winter cover is needed.

This soil is used for homesites in rural areas and in subdivisions around Burley. Homes, roads, or other construction should be designed to overcome low strength and moderate potential frost action. Capability subclass IIe irrigated.

23-Escalante sandy loam, 1 to 3 percent slopes. This is a deep, well drained soil on broad valley terraces. Elevation ranges from 4,100 to 4,800 feet. This soil formed in alluvium and lake sediment derived. from mixed sources. Average annual precipitation is about 9 inches, average annual air temperature is about 49 degrees F, and the frost-free season is 110 to 140 days.

Included with this soil in mapping is Paniogue loam in old drainage channels and Quincy loamy sand in areas of past soil blowing. These soils have 0 to 3 percent slopes, and each makes up 5 percent of the total unit. Also included are areas of Escalante soils that have a water table because of their proximity to constructed drains, canals, or other wet soils.

In a typical profile the surface layer is light brownish gray sandy loam 5 inches thick. Light brownish gray and light gray fine sandy loam is between a depth of 5 and 47 inches. Below this is light brownish gray gravelly sand to a depth of 60 inches or more. The soil is moderately alkaline and is calcareous. A layer of strong lime accumulation is between a depth of 15 and 24 inches.

Permeability is moderately rapid. Effective rooting depth is 40 to 60 inches or more. Available water capacity is 5 to 7 inches. If the soil is irrigated, surface runoff is medium and the hazard of erosion is moderate. Under natural conditions, surface runoff is slow and the hazard of erosion is slight. The hazard of soil blowing is moderate.

This soil is used for irrigated crops, for wildlife habitat, and for limited residential use. Crops are dry beans, potatoes, barley, wheat, sugar beets, pasture, and alfalfa hay. Alfalfa responds to phosphorous fertilizers, and all other crops respond to both nitrogen and phosphorous fertilizers. To maintain good soil tilth, crop rotation should provide for a balance between such soil-depleting crops as sugar beets, and such soil-building crops as alfalfa. It is also important to return organic matter to the soil in the form of manure or crop residue.

This soil is suited to most methods of irrigation especially furrow, corrugation, and sprinkler. It is important not to apply more water to this soil than is needed. This could cause the water table to rise and also cause leaching of nutrients into the ground water where they become pollutants. Irrigation systems should be designed to avoid large stream flows running down the slope.

Areas of this soil are suited to habitat for ring-necked pheasant, Hungarian partridge, mourning dove, and nongame birds. Openland habitat can be improved or maintained for these animals by leaving grassland undisturbed for nesting sites, by leaving unharvested grain crops for food, and by planting trees and shrubs where winter cover is needed.

This soil is used for homesites in rural areas. Homes, roads, or other construction should be designed to overcome low strength and moderate potential frost action. Capability subclass IIe irrigated.

24-Escalante sandy loam, 3 to 7 percent slopes. This is a deep, well drained soil on broad valley terraces. Elevation ranges from 4,200 to 4,800 feet. This soil formed in alluvium and lake sediment derived from mixed sources. Average annual precipitation is about 9 inches, average annual air temperature is about 49 degrees F, and the frost-free season is 110 to 140 days.

Included with this soil in mapping is Paniogue loam that has 2 to 4 percent slopes in drainageways. This included soil makes up about 5 percent of the total unit. Also included are small areas of Escalante soils that have a water table because of their proximity to constructed drains, canals, or other wet soils.

In a typical profile the surface layer is light brownish gray sandy loam 7 inches thick. This is underlain by light brownish gray and light gray fine sandy loam to a depth of 47 inches. Below this is light brownish gray gravelly sand to a depth of 60 inches or more. The soil is mildly alkaline or moderately alkaline and is calcareous. A layer of strong lime accumulation is between a depth of 12 and 24 inches.

Permeability is moderately rapid. Effective rooting depth is 40 to 60 inches or more. Available water capacity is 5 to 7 inches. If this soil is irrigated, surface runoff is medium and the hazard of erosion is high. Under natural conditions, surface runoff is medium and the hazards of erosion and soil blowing are moderate.

This soil is used for irrigated crops, for wildlife habitat, and for limited residential use. Crops are dry beans, potatoes, barley, wheat, sugar beets, pasture, and alfalfa hay. Alfalfa responds to phosphorous fertilizer, and all other crops respond to both nitrogen and phosphorous fertilizers. To maintain good soil tilth, crop rotation should provide for a balance between such soil-depleting crops as sugar beets, and such soil-building crops as alfalfa. It is also important to return organic matter to the soil in the form of manure or crop residue.

Irrigation methods suited to this soil are furrow, corrugation, and sprinkler. It is important not to apply more water to this soil than is needed. This could cause the water table to rise and also cause leaching of nutrients into the ground water. Irrigation water should be applied at a rate that will not cause accelerated erosion and that is based on permeability and slope of the soil. Frequency of irrigation must be based on the limited rooting depth and available water capacity of this soil. Surface irrigation systems should run vertical to the slope to prevent erosion. This soil is well suited to sprinkler irrigation systems.

This soil is suited to habitat for ring-necked pheasant, Hungarian partridge, mourning dove, and nongame birds. Openland habitat can be improved or maintained for these animals by leaving grassland undisturbed for nesting sites, by leaving unharvested grain crops for food, and

by planting trees and shrubs where winter cover is needed.

This soil is used for homesites in rural areas. Homes, roads, or other construction should be designed to overcome low strength and moderate potential frost action. Capability subclass IIIe irrigated.

25-Garbutt silt loam, 0 to 1 percent slopes. This is a deep, well drained soil on broad valley terraces. Elevation ranges from 4,300 to 4,800 feet. This soil formed in alluvium derived from mixed sources. Average annual precipitation is about 8 inches, average annual air temperature is about 49 degrees F, and the frost-free season is 110 to 130 days.

Included with this soil in mapping is Aysee; gravelly loam in old drainage channels and Bram silt loam in depressions. Also included is Garbutt soils that have a water table above 5 feet where drainage ditches or canals have been constructed or where this unit is associated with wetter soils. The included soils have 0 to 1 percent slopes, and each makes up 5 percent of the total unit.

In a typical profile the soil is pale brown and very pale brown silt loam to a depth of 45 inches. Between a depth of 45 to 56 inches is pale brown loam. Below this is pale brown gravelly sandy loam. The soil is calcareous. A layer of lime accumulation is between a depth of 6 and 45 inches. This soil is moderately alkaline and strongly alkaline. It is moderately saline below a depth of 13 inches.

Permeability is moderate. Effective rooting depth is 40 to 60 inches or more. Available water capacity is 8 to 10 inches. Surface runoff is slow, and the hazard of erosion is slight. The hazard of soil blowing is slight.

This soil is used for irrigated crops, for wildlife habitat, and for range. Irrigated crops are alfalfa hay, pasture, barley, wheat, sugar beets, and potatoes. Because of moderate salinity, leaching irrigation is desirable at least once in alternate years. Alfalfa responds to phosphorous fertilizer, and all other crops respond to both nitrogen and phosphorous fertilizers. Crop rotation should provide for a balance between such soil-depleting crops as sugar beets, and such soil-building crops as alfalfa. To maintain good soil tilth, it is important to return crop residue or add manure to the soil.

Irrigation methods suited to this soil are corrugation, furrow, border, and sprinkler. The system used should be designed to replenish the moisture supply in the root zone without causing excessive runoff or deep percolation. However, some excessive irrigation is needed to keep the salinity deep in the soil.

If this soil is irrigated, it is well suited to habitat for ring-necked pheasant, Hungarian partridge, mourning dove, and nongame birds. Openland habitat can be improved by leaving grassland undisturbed and by planting shrubs and trees for nesting sites and cover. Unharvested crops furnish feed. Where this soil is not irrigated, it supports a limited number of upland birds and cottontail. Many mourning doves use areas of this soil during migration. This soil is an important winter range for mule deer. Proper grazing use by livestock and restricted brush control are beneficial to deer.

As range condition deteriorates, perennial grasses decrease and greasewood, poverty weed, and halogeton increase. There is a high chance that seeding will fail because of droughtiness. Siberian wheatgrass, Russian wildrye, and crested wheatgrass are some adapted plants suitable for reseeding. Seeding late in fall achieves the best results. Brush management is desirable if the amount of brush is excessive. Capability subclass VIe nonirrigated and IIs irrigated.

26-Garbutt silt loam, 1 to 3 percent slopes. This is a deep, well drained soil on broad valley terraces. Elevation ranges from 4,600 to 5,400 feet. This soil formed in alluvium derived from mixed sources. Average annual precipitation is about 8 inches, average annual air temperature is about 49 degrees F, and the frost-free season is 100 to 130 days.

Included with this soil in mapping is Aysees gravelly loam in old drainage channels and Bram silt loam in depressions. Also included is Garbutt soils that have a water table above 5 feet where drainage ditches or canals have been constructed or where this unit is associated with wetter soils. The included soils have 1 to 3 percent slopes, and each makes up about 5 percent of the total map unit.

In a typical profile the soil is pale brown and very pale brown silt loam to a depth of 45 inches. Between a depth of 45 and 56 inches is pale brown loam. Below this is pale brown gravelly sandy loam. The soil is calcareous. A layer of lime accumulation is between a depth of 6 and 45 inches. This soil is moderately alkaline and strongly alkaline. It is moderately saline below a depth of 23 inches.

Permeability is moderate. Effective rooting depth is 40 to 60 inches or more. Available water capacity is 8 to 10 inches. Surface runoff is slow, and the hazard of erosion is moderate. The hazard of soil blowing is slight.

This soil is used for irrigated crops, for wildlife habitat, and for range. Irrigated crops are alfalfa hay, pasture, barley, wheat, sugar beets, and potatoes. Because of moderate salinity, leaching irrigation is desirable at least once in alternate years. Alfalfa responds to phosphorous fertilizer, and all other crops respond to both nitrogen and phosphorous fertilizers. Crop rotation should provide for a balance between such soil-depleting crops as sugar beets, and such soil-building crops as alfalfa. To maintain good soil tilth, it is important to return crop residue or add manure to the soil.

Irrigation methods suited to this soil are corrugation, furrow, and sprinkler. The system used should be designed so that the water enters the soil with a minimum flow over the surface. Large surface flows cause accelerated erosion on this soil. Leaching irrigation is needed to keep the salinity deep in the soil.

If this soil is irrigated, it is well suited to habitat for ring-necked pheasant, Hungarian partridge, mourning dove, and nongame birds. Openland habitat can be improved by leaving grassland undisturbed and by planting shrubs and trees for nesting sites and cover. Unharvested crops furnish feed. Where this soil is not irrigated, it sup-

ports a limited number of upland birds and cottontail. Many mourning doves use areas of this soil during migration. This soil is an important winter range for mule deer. Proper grazing use by livestock and restricted brush control are beneficial to deer.

As range condition deteriorates, perennial grasses decrease and greasewood, poverty weed, and halogeton increase. There is a high chance that seeding will fail because of droughtiness. Siberian wheatgrass, Russian wildrye, and crested wheatgrass are some adapted plants suitable for reseeding. Seeding late in fall achieves the best results. Brush management is desirable if the amount of brush is excessive. Capability subclass VIe nonirrigated and IIIs irrigated.

27-Goose Creek silt loam. This is a deep, moderately well drained, nearly level soil on broad valley bottoms. Elevation ranges from 4,100 to 4,600 feet. It is about 5,400 feet in a few small areas. This soil formed in alluvium derived from mixed sources. Average annual precipitation is about 9 inches, average air temperature is about 49 degrees F, and the frost-free season is 115 to 140 days.

Included with this soil in mapping is Beetville loam and Drax silt loam. There is no pattern of occurrence for these soils. Each of the included soils makes up about 5 percent of the total map unit. Also included is Goose Creek silty clay loam, wet, in areas near drainage channels or canals. This soil makes up 10 percent of the map unit. The included soils have 0 to 1 percent slopes.

In a typical profile the surface layer is gray and grayish brown silt loam, loam, and clay loam 22 inches thick. This is underlain by light brownish gray and light gray loam, very fine sandy loam, and silt loam to a depth of 60 inches. This soil is noncalcareous and is moderately alkaline. It is mottled below a depth of 34 inches. Originally this soil had a water table at a depth of about 30 inches for part of the year in most years, but this -water is now diverted by major irrigation systems. The water table is presently below a depth of 54 inches during most years. In the extremely dry years, when an excessive amount of irrigation water is used, the water table will rise to within a depth of 30 inches in some areas.

Permeability is moderately slow. Effective rooting depth is 60 inches or more. Available water capacity is 8.5 to 12 inches. Surface runoff is slow, and the hazards of erosion and soil blowing are slight.

This soil is used for irrigated crops, for wildlife habitat, and for residential use in the cities of Burley and Oakley. Irrigated crops are barley, wheat, potatoes, dry beans, alfalfa hay, sugar beets, and pasture. Alfalfa responds to phosphorous fertilizer, and all other crops respond well to both nitrogen and phosphorous fertilizers. Crop rotation should provide for a balance between such soil-depleting crops as potatoes, and such soil-building crops as alfalfa. Organic matter should be returned to the soil in the form of crop residue or manure.

Irrigation methods suited to this soil are border, furrow, corrugation, and sprinkler. Overwatering should be avoided since this can cause the water table to rise to a hazardous level. Muddy conditions make the use of sprinklers more difficult.

This soil is suited to habitat for ring-necked pheasant, Hungarian partridge, mourning dove, and nongame birds. Openland habitat can be improved or maintained for these animals by leaving grassland undisturbed for nesting sites, by leaving unharvested grain crops for food, and by planting trees and shrubs where winter cover is needed. Where this soil is adjacent to bodies of water, it can be important to waterfowl for feeding areas and, where desired, shallow water areas can be constructed to provide nesting and loafing habitat.

When this soil is used for homesites, roads, or other construction, the design should protect against moderate potential frost action and moderate shrink-swell hazard. This soil should be investigated to be sure that the area does not have a water table before constructing homes with basements. Capability subclass IIc irrigated.

28-Goose Creek silty clay loam. This is a deep, moderately well drained, nearly level soil on broad valley bottoms. Elevation ranges from 4,100 to 4,500 feet. This soil formed in alluvium derived from mixed sources. Average annual precipitation is about 9 inches, average annual air temperature is about 49 degrees F, and the frost-free season is 120 to 140 days.

Included with this soil in mapping is Beetville loam and Drax silt loam. There is no pattern of occurrence for these soils. These included soils each make up about 5 percent of the total map unit. Also included is Goose Creek silty clay loam, wet, in areas near drainage channels or canals. This soil makes up 10 percent of the map unit. The included soils have 0 to 1 percent slopes.

In a typical profile the surface layer is gray, grayish brown, and dark gray silty clay loam 24 inches thick. This is underlain by light brownish gray and light gray loam, silty clay loam, and silt loam to a depth of 60 inches. This soil is noncalcareous and is moderately alkaline. It is mottled below a depth of 24 inches. Originally this soil had a water table at a depth of about 30 inches for part of the year in most years. This water now is diverted by major irrigation systems. The water table is presently below a depth of 54 inches during most years. In years when excessive irrigation water is used, the water table will rise to within 30 inches in some areas.

Permeability is moderately slow. Effective rooting depth is 60 inches or more. Available water capacity is 8.5 to 12 inches. Surface runoff is slow, and the hazards of erosion and soil blowing are slight.

This soil is used for irrigated crops, for wildlife habitat, and for residential use in the cities of Burley and Oakley. Irrigated crops are barley, wheat, potatoes, dry beans, alfalfa hay, sugar beets, and pasture. Alfalfa responds to phosphorous fertilizer, and all other crops respond well to both nitrogen and phosphorous fertilizers. Crop rotation should provide for a balance between such soil-depleting crops as potatoes, and such soil-building crops as alfalfa. Organic matter should be returned to the soil in the form

of crop residue or manure. This soil should not be plowed when it is either too wet or too dry since this will cause compaction or formation of clods.

Irrigation methods suited to this soil are border, furrow, corrugation, and sprinkler. Overwatering should be avoided since this can cause the water table to rise to a hazardous level. The surface layer of this soil remains wet for a long period after irrigation, causing difficulty in moving sprinkler irrigation systems.

This soil is suited to habitat for ring-necked pheasant, Hungarian partridge, mourning dove, and nongame birds. Openland habitat can be improved or maintained for these animals by leaving grassland undisturbed for nesting sites, by leaving unharvested grain crops for food, and by planting trees and shrubs where winter cover is needed. Where this soil is adjacent to bodies of water, it can be important to waterfowl for feeding areas, and where desired, shallow water areas can be constructed to provide nesting and loafing habitat.

When this soil is used for homesites, roads,, or other construction, the design should protect against moderate potential frost action and moderate shrink-swell hazard. This soil should be investigated to be sure that the area does not have a water table before constructing homes with basements. Capability subclass IIc irrigated.

29-Goose Creek silty clay loam, wet. This is a deep, somewhat poorly drained, nearly level soil on broad valley bottoms. Elevation ranges from 4,100 to 4,500 feet. This soil formed in alluvium derived from mixed sources. Average annual precipitation is about 9 inches, average annual air temperature is about 49 degrees F, and the frost-free season is 120 to 140 days.

Included with this soil in mapping is Wodskow loam and Drax silt loam, wet. There is no pattern of occurrence for these soils. The included soils have 0 to 1 percent slopes and each makes up about 5 percent of the total map unit.

In a typical profile the surface layer is gray, grayish brown, and dark gray silty clay loam 24 inches thick. This is underlain by light brownish gray and light gray loam, silty clay loam, and silt loam to a depth of 60 inches. This soil is noncalcareous and is moderately alkaline. It is mottled below a depth of 24 inches. This soil has a water table at a depth of about 30 to 40 inches for part of the year in most years.

Permeability is moderately slow. Effective rooting depth is 60 inches or more. Available water capacity is 8.5 to 12 inches. Surface runoff is slow, and the hazards of erosion and soil blowing are slight.

This soil is used for irrigated crops, for wildlife habitat, and for residential use in the cities of Burley and Oakley. Irrigated crops are barley, wheat, potatoes, dry beans, alfalfa hay, sugar beets, and pasture. Alfalfa responds to phosphorous fertilizer, and all other crops respond well to both nitrogen and phosphorous fertilizers. Crop rotation should provide for a balance between such soil-depleting crops as potatoes, and such soil-building crops as alfalfa. Organic matter should be returned to the soil in the form of crop residue or manure.

This soil is suited to most methods of irrigation especially furrow, border, corrugation, and sprinkler. Overwatering should be avoided since this causes the water table to rise. Because the surface layer is wet and muddy for long periods, it is difficult to move sprinklers around.

This soil is suited to habitat for ring-necked pheasant, Hungarian partridge, mourning dove, and nongame birds. Openland habitat can be improved or maintained for these animals by leaving grassland undisturbed for nesting sites, by leaving unharvested grain crops for food, and by planting trees and shrubs where winter cover is needed. Where this soil is adjacent to bodies of water, it can be important to waterfowl for feeding areas, and where desired, shallow water areas can be constructed to provide nesting and loafing habitat.

When this soil is used for homesites, roads, or other construction, the design should protect against the moderate potential frost action and moderate shrink-swell hazard. Homes with basements should be artificially drained or built with an excavation of less than 2 feet because of the water table. Capability subclass IIw irrigated.

30-Hymas-Rock outcrop complex. The soil and miscellaneous areas in this unit are on limestone mountainsides. Elevation ranges from 5,000 to 6,500 feet. Hymas cobbly loam that has slopes of 25 to 60 percent makes up 65 percent of the unit and is on mountainsides. Rock outcrop makes up 20 percent and is on small ridgecrests.

The rest of this unit is Pocatello silt loam, 12 to 30 percent slopes, in more level areas; Winu stony silt loam, 30 to 60 percent slopes, on lower mountainsides; and a soil similar to Hymas soils that is less than 10 inches deep to bedrock. Each of these soils makes up about 5 percent of the total map unit.

The Hymas soil is shallow and well drained and formed in material weathered from limestone. Average annual precipitation is about 14 inches, average annual air temperature is about 43 degrees F, and the frost-free season is 60 to 100 days. In a typical profile the soil is grayish brown and brown cobbly loam and very cobbly loam to a depth of 17 inches. Below this is limestone bedrock. The soil is calcareous and is moderately alkaline.

Permeability is moderate. Effective rooting depth is 10 to 20 inches. Available water capacity is 0.8 to 2.0 inches. Surface runoff is rapid, and the hazard of erosion is very high. The hazard of soil blowing is slight.

Rock outcrop consists of bare limestone bedrock.

These steep rocky soils are used for range and for wildlife habitat. They have very little value for producing a large amount of wildlife. Wildlife in the area are small rodents and predators. Mule deer use the brushy plant species for food.

As range condition deteriorates, bluebunch wheatgrass and Idaho fescue decrease and low sagebrush and forbs increase. Juniper also invades this site. Reseeding is not feasible because of steepness, stoniness, and shallowness. Brush management generally is not recommended on

these soils. Grazing management is the best method of improving range conditions. Capability subclass VIIs.

31-Itca-Kanlee complex. The soils in this unit are on quartz latite hillsides and terraces (fig. 10). Elevation ranges from 5,000 to 7,000 feet. Itca stony sandy loam that has slopes of 3 to 20 percent makes up 45 percent of this unit and has south- and west-facing slopes. Kanlee loam that has slopes of 3 to 20 percent makes up 30 percent and has north- and east-facing slopes.

The rest of this unit is Reywat cobbly loam, 0 to 30 percent, and Mackey very stony sandy loam, 12 to 60 percent slopes, at the lower end of the hillsides. Reywat cobbly loam makes up 5 percent of the total map unit, and Mackey very stony sandy loam and Rock outcrop make up 10 percent.

The Itca soil is shallow and well drained aid formed in material recently decomposed from quartz latite. Average annual precipitation is about 14 inches, average annual air temperature is about 44 degrees F, and the frost-free season is 80 to 100 days. In a typical profile the surface layer is grayish brown stony coarse sandy loam 4 inches thick. The subsoil is brown and light brown very stony heavy sandy clay loam and very stony clay loam 13 inches thick. Bedrock is below this. The soil is mildly alkaline and moderately alkaline and is noncalcareous.

Permeability is slow. Effective rooting depth is 10 to 20 inches. Available water capacity is 0.8 to 1.6 inches. Surface runoff is medium or rapid, and the hazard of erosion is high. The hazard of soil blowing is slight.

The Kanlee soil is moderately deep and well drained and formed in material recently decomposed from quartz latite and loess. Average annual precipitation is about 17 inches, average annual air temperature is about 42 degrees F, and the frost-free season is 70 to 90 days. In a typical profile the surface layer is grayish brown stony loam and stony clay loam 10 inches thick. The subsoil is yellowish brown stony clay loam 28 inches thick. Bedrock is below this. The soil is neutral and is noncalcareous.

Permeability is moderately slow. Effective rooting depth is 20 to 40 inches. Available water capacity is 3.0 to 4.5 inches. Surface runoff is rapid, and the hazard of erosion is high. The hazard of soil blowing is slight.

These soils are used for range and for wildlife habitat. They have potential for recreational development such as camping, outdoor classrooms, or nature areas. These uses need to be designed to overcome the slope and stoniness.

The inclusion of small pockets of aspen and brushy areas makes this area highly desirable for mule deer. Steep slopes prevent wetland development. This area is important to some nongame birds but is undesirable for pheasant because of high elevation, long cold winters, and lack of cropland. This habitat also supports a limited number of forest grouse. Habitat improvement is limited to forest and rangeland practices.

As range condition on the Itca soil deteriorates, bluebunch wheatgrass and Idaho fescue decrease and low sagebrush and forbs increase. Juniper also invades this site. As range condition on the Kanlee soil deteriorates, bluebunch wheatgrass and Idaho fescue decrease and needlegrasses, bluegrass, and big sagebrush increase. Range can be reseeded with adapted grasses if range condition is poor. Whitmar bluebunch wheatgrass, pubescent wheatgrass, intermediate wheatgrass and bitterbrush are some adapted plants suitable for reseeding. Brush management is desirable if the amount of brush is excessive. Fall seeding achieves the best results. Capability subclass VIs.

32-Kimama silt loam. This is a deep, well drained, nearly level soil on uplands. Elevation ranges from 4,100 to 4,500 feet. This soil formed in alluvium derived from loess deposits. Average annual precipitation is about 10 inches, average annual air temperature is about 48 degrees F, and the frost-free season is 110 to 130 days.

Included with this soil in mapping is Rad silt loam and Portneuf silt loam on pockets of limy material or in cemented areas and Neeley silt loam at higher elevations. These included soils have 0 to 2 percent slopes, and each of the included soils makes up 5 percent of the total unit.

In a typical profile the surface layer is brown silt loam 11 inches thick. The subsoil is pale brown silt loam 13 inches thick. This is underlain by pale brown and very pale brown silt loam to a depth of 60 inches. The soil is mildly alkaline and moderately alkaline to a depth of 38 inches and is strongly alkaline below that. It is noncalcareous to a depth of 24 inches and is calcareous below that. Weak silica cementation is at a depth of 24 to 28 inches.

Permeability is moderate. Effective rooting depth is 40 to 60 inches or more. Available water capacity is 8 to 12 inches. Surface runoff is slow, and the hazards of erosion and soil blowing are slight.

This soil is used for irrigated crops, for wildlife habitat, and for range. Irrigated crops are alfalfa hay, pasture, corn, potatoes, sugar beets, barley, and wheat. Nitrogen fertilizer is used on all crops except alfalfa, and phosphorous fertilizer is used on all crops. To maintain good soil tilth and high yields, it is necessary to return organic matter or manure to the soil. Crop rotation should provide for a balance between such soil-depleting crops as sugar beets, and such soil-building crops as alfalfa.

Irrigation methods suited to this soil are furrow, corrugation, border, and sprinkler. The system used should be designed to fit crop needs and to conserve water.

If this soil is irrigated, it is well suited to habitat for ring-necked pheasant, Hungarian partridge, mourning dove, and nongame birds. Openland habitat can be improved by leaving grassland undisturbed and by planting shrubs and trees for nesting sites and cover. Unharvested crops furnish feed. Where this soil is not irrigated, it supports a limited number of upland birds and cottontail. Many mourning doves use areas of this soil during migration.

As range condition deteriorates, perennial grasses and other desirable plants decrease and sagebrush increases. Range can be seeded if range condition is poor. Siberian and crested wheatgrass, Russian wildrye, and Whitmar

bluebunch wheatgrass are some adapted plants suitable for reseeding. There is a moderate to high chance that seeding will fail because of droughtiness. Fall seeding achieves the best results. Brush management is desirable if the amount of brush is excessive. Capability subclass VIc nonirrigated and IIe irrigated.

33-Kucera silt loam, 12 to 30 percent slopes. This is a deep, well drained soil on north-facing hillsides. Elevation ranges from 5,000 to 6,500 feet. This soil formed in loess. Average annual precipitation is about 14 inches, average annual air temperature is about 43 degrees F, and the frost-free season is 80 to 100 days.

Included with this soil in mapping is Disautel loam, 3 to 7 percent slopes, in drainage channels and Bedke silt loam, 3 to 12 percent slopes, on ridgetops. These included soils each make up 5 percent of the total unit.

In a typical profile the surface layer is grayish brown and brown silt loam 24 inches thick. This is underlain by pale brown silt loam to a depth of 60 inches. The soil is noncalcareous to a depth of 54 inches and is calcareous below that. It is neutral and mildly alkaline.

Permeability is moderate. Effective rooting depth is more than 60 inches. Available water capacity is 9 to 12 inches. Surface runoff is rapid, and the hazard of erosion is high. The hazard of soil blowing is slight.

This soil is used for nonirrigated crops, for wildlife habitat, and for range. Barley and wheat are grown on this soil. If this soil is unprotected, crop stubble or other kinds of organic matter can be used to protect it. This soil is tilled only as much as necessary to seed and establish the crop. All tillage operations should be across the slope. This soil should be left idle in alternate years to conserve moisture. Small grain responds well to nitrogen fertilizer but the amount must be carefully controlled. Excessive nitrogen causes excess use of the limited available moisture.

This soil supports a limited number of Hungarian partridge, pheasant, and cottontail. Many mourning doves use areas of this soil during migration. The steep slopes prevent water development which is essential for wetland wildlife. This habitat has high potential for mule deer winter range. Proper grazing use and restricted brush control are beneficial to mule deer.

As range condition deteriorates, alkali sacaton, basin wildrye, and alkali bluegrass decrease and black greasewood and inland saltgrass increase. Range can be seeded if range condition is poor. Tall wheatgrass, tall fescue, Garrison creeping foxtail, and birdsfoot trefoil are some of the plants suitable for seeding. Fall seeding generally achieves the best results. Capability subclass IVe nonirrigated.

34-Kucera silt loam, 30 to 60 percent slopes. This is a deep, well drained soil on north-facing hillsides. Elevation ranges from 4,500 to 6,500 feet. This soil formed in loess. Average annual precipitation is about 14 inches, average annual air temperature is about 43 degrees F, and the frost-free season is 80 to 100 days.

Included with this soil in mapping is Disautel loam, 3 to 7 percent slopes, and Alpowa cobbly loam, 20 to 60 percent slopes. These included soils are near toeslopes and in drainage channels, and each make up about 5 percent of the total unit.

In a typical profile the surface layer is brown and grayish brown silt loam 34 inches thick. The subsoil is pale brown and very pale brown silt loam 13 inches thick. This is underlain by pale brown silt loam to a depth of 60 inches. The soil is mildly alkaline or moderately alkaline to a depth of 47 inches and is strongly alkaline below that. It is noncalcareous to a depth of 34 inches and is calcareous below that. A layer of lime accumulation is between a depth of 47 and 60 inches.

Permeability is moderate. Effective rooting depth is more than 60 inches. Available water capacity is 9 to 12 inches. Surface runoff is rapid, and the hazard of erosion is very high. The hazard of soil blowing is slight.

This soil is used for range and for wildlife habitat. It supports a limited number of Hungarian partridge, pheasant, and cottontail. Many mourning doves use areas of this soil during migration. The very steep slopes prevent water development which is essential for wetland wildlife. This habitat has high potential for mule deer winter range. Proper grazing use and restricted brush control are beneficial to mule deer.

As range condition deteriorates, bluebunch wheatgrass and Idaho fescue decrease and big sagebrush increases. Range seeding is not recommended by conventional methods on slopes that are steeper than 30 percent. Brush management is desirable if the amount of brush is excessive. Capability subclass VIIe.

35-Mackey-Rock outcrop complex. The soil and miscellaneous area in this unit are on escarpment sides (fig. 11). Elevation ranges from 4,500 to 6,000 feet. Mackey very stony sandy loam that has slopes of 12 to 60 percent makes up 60 percent of the unit and is on the scarp side. Rock outcrop makes up 25 percent and is at scarp head slopes on ledges.

The rest of this unit is Kanlee stony loam that has 3 to 20 percent slopes at higher elevations and on north-facing slopes; Pocatello silt loam, 12 to 30 percent slopes, near the lower edge of the escarpment; and Mulett very stony loam, 4 to 20 percent slopes, associated with Rock outcrop. These included soils each make up 5 percent of the total map unit.

The Mackey soil is moderately deep and well drained and formed in alluvium and colluvium derived from intermediate and basic igneous rocks. Average annual precipitation is about 12 inches, average annual air temperature is about 49 degrees F, and the frost-free season is 100 to 120 days. In a typical profile the surface layer is light brownish gray very stony sandy loam 4 inches thick. The subsoil is light yellowish brown very stony clay loam and very stony loam 8 inches thick. The underlying layer is pale brown very stony sandy loam and very stony loamy sand to a depth of 32 inches. Bedrock is below this. The soil is mildly alkaline to a depth of 12 inches and is

moderately alkaline below that. It is noncalcareous to a depth of 10 inches and is calcareous below that.

Permeability is moderately rapid. Effective rooting depth is 20 to 40 inches. Available water capacity is 1.6 to 3.0 inches. Surface runoff is rapid, and the hazard of erosion is high. The hazard of soil blowing is slight.

Rock outcrop consists of bare intermediate and basic igneous rock. It occurs as ledges and outcrop.

The Mackey soil is used for range and for wildlife habitat.

These steep, rocky soils have very little value for producing a large number of wildlife game. Wildlife in the area includes small rodents and predators. Mule deer use the brushy plant species for food in winter.

As range condition deteriorates on the Mackey soil, bluebunch wheatgrass and Thurber needlegrass decrease and big sagebrush and annual grasses increase. Because of stones, rock outcrop, and steep slopes, reseeding is not feasible. Proper grazing and a grazing system for livestock are essential. Brush management generally is not used on these soils. Capability subclass VIIs nonirrigated.

36-McMeen silty clay loam. This is a deep, nearly level soil on broad valley terraces that has a cemented pan at a moderate depth. Elevation ranges from 4,200 to 4,400 feet. This soil formed in alluvium derived from mixed sources. Average annual precipitation is about 10 inches, average annual air temperature is about 49 degrees F, and the frost-free season is 110 to 120 days.

Included with this soil in mapping is Abo loam in depressions or near watercourses, Weeks loam on uplands, and Paulville clay loam in small, obscure playas. These included soils have slopes of 0 to 2 percent, and each makes up about 5 percent of the map unit.

In a typical profile the surface layer is grayish brown silty clay loam 5 inches thick. The subsoil is grayish brown silty clay loam 21 inches thick. A weakly cemented hardpan is at a depth of 46 inches. Very pale brown fine sandy loam is between a depth of 46 and 60 inches. The soil is moderately alkaline. It is noncalcareous to a depth of 22 inches and is calcareous below that.

Permeability is moderately slow. Effective rooting depth is 40 to 60 inches or more. There is some restriction between a depth of 20 and 40 inches because of weak silica cementation. Available water capacity is 8 to 10 inches. Surface runoff is slow, and the hazards of erosion and soil blowing are slight.

This soil is used primarily for irrigated crops and for wildlife habitat. Minor areas are used for roads and homesites. Crops are alfalfa hay, pasture, corn, potatoes, sugar beets, dry beans, wheat, and barley. To maintain good soil tilth, it is important to rotate crop a. Crop rotation should provide for a balance between such soil-depleting crops as sugar beets, and such soil-building crops as alfalfa. It is also important to return crop residue or to add manure to the soil. Nitrogen and phosphorous fertilizers are beneficial to all crops except alfalfa. Alfalfa responds only to phosphorous fertilizer. Because this soil is silty clay loam it should be plowed at the proper moisture level to prevent puddling or formation of excessive clods.

Irrigation methods suited to this soil are furrow, corrugation, border, and sprinkler. Because of the moderately slow permeability, water must be applied at a slow rate for longer periods to moisten the profile. Self-propelled sprinklers have some problems since this soil is very unstable when wet.

This soil is suited to habitat for ring-necked pheasant, Hungarian partridge, mourning dove, and nongame birds. Openland habitat can be improved or maintained for these animals by leaving grassland undisturbed for nesting sites, by leaving unharvested grain crops for food, and by planting trees and shrubs where winter cover is needed.

This soil is used for homesites in rural areas. Homes, roads, or other construction should be designed to allow for a moderate shrink-swell hazard and potential frost action. Septic tank filter fields need to be designed to allow the effluent a large area of percolation because of the moderately slow permeability. Capability subclass IIc irrigated.

37-Mulett very stony loam, 4 to 20 percent slopes. This is a shallow and well drained soil on hillsides. Elevation ranges from 4,800 to 5,500 feet. This soil formed in material recently decomposed from quartz latite. Average annual precipitation is about 10 inches, average annual air temperature is about 48 degrees F, and the frost-free season is 100 to 120 days.

Included with this soil in mapping is Scoon silt loam in depressions and Taunton loam on ridgetops. These included soils have 1 to 20 percent slopes. Scoon silt loam makes up about 10 percent of the map unit, and Taunton loam makes up 5 percent.

In a typical profile the soil is pale brown very stony loam to a depth of 14 inches. Below this is bedrock. The soil is moderately alkaline and is noncalcareous to a depth of 11 inches. It is calcareous and is strongly alkaline below that.

Permeability is moderate. Effective rooting depth is 12 to 20 inches. Available water capacity is 1 to 2 inches. Surface runoff is medium, and the hazard of erosion is high. The hazard of soil blowing is slight.

This soil is used for range and for wildlife habitat. The inclusion of small pockets of brushy areas makes this soil desirable for mule deer winter range. Steep slopes and shallow soils prevent wetland development. This area is important to some nongame birds but is undesirable for pheasant, because of the lack of cropland. This habitat also supports a limited number of chukar, quail, and Hungarian partridge. Habitat improvement is limited to rangeland practices.

As range condition deteriorates, bluebunch wheatgrass and Thurber needlegrass decrease and low sagebrush, forbs, and weedy annuals increase. Reseeding is not feasible on this soil because of shallow soil depth and stoniness. Brush management generally is not recommended.

Grazing management is the best method of improving range condition. Capability subclass VIIs nonirrigated.

38-Neeley silt loam, 4 to 12 percent slopes. This is a deep, well drained soil on hillsides (fig. 12). Elevation ranges from 4,800 to 5,500 feet. This soil formed in loess. Average annual precipitation is about 13 inches, average annual air temperature is about 47 degrees F, and the frost-free season is 100 to 120 days.

Included with this soil in mapping is Alpowa loam, 3 to 12 percent slopes, in drainage channels and Bedke silt loam, 3 to 12 percent slopes, on ridgetops. These included soils each make up 5 percent of the map unit.

In a typical profile the surface layer is grayish brown silt loam 6 inches thick. The subsoil is brown and pale brown silt loam 24 inches thick. This is underlain by very pale brown and light gray silt loam to a depth of 60 inches. This soil is noncalcareous to a depth of 30 inches and is calcareous below that. It is mildly alkaline and moderately alkaline.

Permeability is moderate. Effective rooting depth is more than 60 inches. Available water capacity is 9 to 12 inches. Surface runoff is medium, and the hazard of erosion is moderate. The hazard of soil blowing is slight.

This soil is used for nonirrigated crops, far wildlife habitat, and for range. It has potential for irrigated crops. Because of the slopes and broken topography, sprinkler irrigation is required. Barley and wheat are grown on this soil. If this soil is unprotected, crop stubble or o her kinds of organic matter can be used to protect it. Where this soil is cropped, it is tilled only as much as necessary to seed and establish the crop. All tillage operations are across the slope. This soil should be left idle in alternate years to conserve moisture. Small grain responds well to nitrogen fertilizer but the amount must be carefully controlled. Excessive nitrogen causes excess use of the limited available moisture.

This soil supports a limited number of Hungarian partridge, pheasant, and cottontail. Many mourning doves use areas of this soil during migration. The steep slopes prevent water development which is essential for wetland wildlife. This habitat has high potential for :mule deer winter range. Proper grazing use and restricted brush control are beneficial to male deer.

As range condition deteriorates, wheatgrasses decrease and sagebrush and other less desirable plants increase. Weeds and other undesirable plants invade. Range can be reseeded with adapted grasses if range condition is poor. Fall seeding achieves the best results. Whitmar bluebunch wheatgrass, pubescent wheatgrass, intermediate wheatgrass, alfalfa, and bitterbrush are some adapted plants suitable for reseeding. Brush management is desirable if the amount of brush is excessive. Capability subclass IIIe nonirrigated.

39-Paniogue-Buko complex. The soils in this unit are on stream terraces. Elevation ranges from 4,100 to 4,800 feet. Paniogue loam that has slopes of 2 to 4 percent makes up 45 percent of this unit and is generally nearer to recently disturbed areas, such as stream channels. Buko loam that has slopes of 2 to 4 percent makes up 35 percent and is in more stable areas. The pattern of occurrence is complex and generally requires observation of the soil profiles. Average annual precipitation is about 10 inches, average annual air temperature is about 49 degrees F, and the frost-free season is 110 to 140 days.

The rest of this unit is a soil similar to the Paniogue soil except it is gravelly sandy loam above the gravel and sand layer. This soil is along recent channels and makes up 5 percent of the total map unit. Also included is a soil similar to Buko loam and Paniogue loam that has 4 to 12 percent slopes. This soil is mostly along breaks and terrace edges and makes up 10 percent of the map unit. Pockets of soils deep to gravel and sand are included and make up 5 percent of the unit.

The Paniogue soil is deep and well drained and formed in mixed stream sediment. In a typical profile the surface layer is pale brown loam 9 inches thick. The subsoil is pale brown loam and very fine sandy loam 12 inches thick. This is underlain by very gravelly sand to a depth of 60 inches. The soil is moderately alkaline and is noncalcareous to a depth of 9 inches. A layer of lime accumulation is between a depth of 9 and 21 inches.

Permeability is moderate. Effective rooting depth is 20 to 40 inches. Available water capacity is 2.5 to 5.0 inches. If this soil is irrigated, surface runoff is medium and the hazard of erosion is moderate. Under natural conditions, surface runoff is slow and the hazards of erosion and soil blowing are slight.

The Buko soil is deep and well drained and formed in mixed stream sediment. In a typical profile the surface layer is brown loam 7 inches thick. The next layer is pale brown and very pale brown loam and clay loam 21 inches thick. This is underlain by very gravelly loamy sand to a depth of 60 inches. The soil is moderately alkaline. It is noncalcareous to a depth of 12 inches and is calcareous below this. A layer of lime accumulation is between a depth of 20 and 28 inches. Either weak silica cementation or hard nodules is in the soil between a depth of 12 and 28 inches.

Permeability is moderately slow. Effective rooting depth is 20 to 40 inches. Available water capacity is 2.5 to 5.0 riches. Surface runoff is medium and the hazard of erosion is moderate. The hazard of soil blowing is slight.

These soils are used for irrigated crops, for wildlife habitat, for rural development, and for range. They are also used as source material for gravel, with the screenings from this used to a limited extent for sand.

Irrigated crops are barley, wheat, sugar beets, potatoes, dry beans, alfalfa hay, and pasture. Alfalfa responds to phosphorous fertilizer, and all other crops respond to both nitrogen and phosphorous fertilizers. To maintain good soil tilth, it is important to add manure or crop residue to other fertilizers. Crop rotation should provide for a balance between such soil-depleting crops as potatoes, and such soil-building crops as alfalfa.

Irrigation methods suited to these soils are furrow, border, corrugation, and sprinkler. Because of the under-

lying coarse materials these soils must be irrigated so that the soil above this material is filled without causing losses due to deep percolation. The frequency of irrigation is based on the rooting depth and available water capacity of the soils. If the surface of the soil is to be reshaped for an irrigation system, the depth to coarse material should be considered before cuts are made.

These soils are suited to habitat for ring-necked pheasant, Hungarian partridge, mourning dove, and nongame birds. Openland habitat can be improved or maintained for these animals by leaving grassland undisturbed for nesting sites, by leaving unharvested grain crops for food, and by planting trees and shrubs where winter cover is needed.

As range condition deteriorates, perennial grasses and other desirable plants decrease and sagebrush increases. Range can be seeded if range condition is poor. Siberian and crested wheatgrass, Russian wildrye, and Whitmar bluebunch wheatgrass are some adapted plants suitable for reseeding. There is a moderate to high chance that seeding will fail because of droughtiness. Fall seeding achieves the best results. Brush management is desirable if the amount of brush is excessive.

These soils are used for homesites. Most homes are in rural areas, but there are some subdivision developments near the town of Burley. For best results, foundations should be put in coarse material at a depth of 20 to 40 inches. Septic tank drainage fields function well if placed in this coarse material, but there is a hazard of pollution from deep percolation. Care should be taken to fracture the cemented layer in the Buko soil when it is used for a filter field or it will inhibit percolation. Capability subclass VIe nonirrigated and IIIe irrigated.

40-Paulville clay loam. This is a deep, well drained, nearly level soil on flood plains or lake terraces. Elevation ranges from 4,100 to 4,500 feet. This soil formed in alluvium on lake sediment derived from mixed sources. Average annual precipitation is about 9 inches, average annual air temperature is about 49 degrees F, and the frost-free season is 125 to 140 days.

Included with this soil in mapping is Abo loam near drainage ditches or irrigation canals or in depressions and Paulville silty clay in old playas. These included soils each make up about 5 percent of the map unit. Also included is Paulville sandy loam and Paulville loamy sand in areas associated with coarser textured soils and Declo sandy loam scattered throughout the map unit. Paulville sandy loam and Paulville loamy sand each make up 10 percent of the map unit, and Declo sandy loam makes up 5 percent. These included soils have 0 to 2 percent slopes.

In a typical profile the surface layer is pale brown clay loam 5 inches thick. The subsoil is pale brown clay loam 10 inches thick. The substratum is stratified very pale brown silt loam to a depth of 60 inches. A layer of lime accumulation is between a depth of 15 and 37 inches. This soil is moderately alkaline.

Permeability is moderately slow. Effective rooting depth is generally 60 inches or more. Available water capacity is 8 to 10 inches. Surface runoff is slow, and the hazard of erosion is slight. The hazard of soil blowing is slight, except in areas of sandy loam and loamy sand where it is high.

This soil is used for irrigated crops and associated wildlife habitat in nearly all areas. It is also used for homesites and roads.

Crops are sugar beets, wheat, barley, potatoes, corn silage, pasture, and alfalfa hay. To maintain good soil tilth, it is important to return crop residue and manure to the soil. Crop rotation should provide for a balance between such soil-depleting crops as sugar beets and potatoes, and such soil-building crops as alfalfa. Nitrogen and phosphorous fertilizers are beneficial to all crops except legumes which respond only to phosphorous fertilizer.

Irrigation methods suited to this soil are furrow, corrugation, border, and sprinkler. Because of the moderately slow permeability, water must be applied at a slow rate and kept on the surface long enough to wet the entire root zone. Sprinklers are difficult to move since this soil is unstable when wet.

This soil is suited to habitat for ring-necked pheasant, Hungarian partridge, mourning dove, and nongame birds. Openland habitat can be improved or maintained for these animals by leaving grassland undisturbed for nesting sites, by leaving unharvested grain crops for food, and by planting trees and shrubs where winter cover is needed.

This soil is used for homesites in rural areas. Homes, roads, or other construction should be designed to allow for a moderate shrink-swell hazard and potential frost action. Septic tank filter fields need to be designed to allow a large area for percolation of the effluent because of the moderately slow permeability. Capability subclass IIc irrigated.

41-Pits. This miscellaneous area is located in many parts of the survey area. It is open excavations from which the soil material or underlying gravel, or sand, has been taken. The material removed has been used for construction of dams, highways, highway surfacing, or concrete. In a few areas, rock has been quarried from the pits. The material remaining in the pits is gravelly or cobbly, and the fine earth is generally loamy sand or sand but is silt loam in some areas. A few areas are bedrock in the bottom. The side slopes of these pits are very steep, or vertical, and are very rough. A shallow water table is in the bottom of a few pits.

Most areas of Pits support only weeds or are barren. Some areas of the Pits are used for sanitary landfills; others have been reclaimed and are used for cropland. Both of these uses require that the surface layer, which was initially pushed aside as overburden, be returned to the site and used to cover the underlying strata or solid waste. Many areas of Pits are left as wasteland. The suitability for reclamation depends on the type of material left in the bottom of the pit, the amount of overburden stockpiled, and the depth to the water table. Pits are not classified in a capability unit.

42-Pocatello silt loam, 0 to 1 percent slopes. This is a deep, well drained soil on broad loess uplands. Elevation ranges from 4,200 to 4,600 feet. This soil formed in loess. Average annual precipitation is about 9 inches, average annual air temperature is 49 degrees F, and the frost-free season is 120 to 140 days.

Included with this soil in mapping is Portneuf silt loam on uplands and Rad silt loam in depressions. Also included is Garbutt silt loam in areas where this soil is associated with saline-alkali soils. The included soils have 0 to 1 percent slopes, and each makes up 5 percent of the map unit.

In a typical profile the soil is pale brown and very pale brown silt loam to a depth of 60 inches. The soil is calcareous and is moderately alkaline.

Permeability is moderate. Effective rooting depth is 40 to 60 inches or more. Available water capacity it 8 to 12 inches. Surface runoff is slow, and the hazards of erosion and soil blowing are slight.

This soil is used for irrigated crops, for wildlife habitat and for range. Irrigated crops are sugar beets, alfalfa hay, pasture, wheat, barley, dry beans, and potatoes. Alfalfa responds to phosphorous fertilizer, and all other crops respond to both nitrogen and phosphorous fertilizers. Crop rotation should provide for a balance between such soil-depleting crops as sugar beets, and such soil-building crops as alfalfa. To maintain good soil tilth, it is important to return crop residue or add manure to the soil.

Irrigation methods suited to this soil are corrugation, furrow, border, and sprinkler. The system used should be designed to replenish the moisture supply in the root zone without causing excessive surface runoff or deep percolation.

If this soil is irrigated, it is well suited to habitat for ring-necked pheasant, Hungarian partridge, mourning dove, and nongame birds. Openland habitat can be improved by leaving grassland undisturbed and by planting shrubs and trees for nesting sites and cover. Unharvested crops furnish feed. Where this soil is not irrigated, it supports a limited number of predators and nongame birds and cottontail. Many mourning doves use areas of this soil during migration.

As range condition deteriorates, perennial grasses and other desirable plants decrease and sagebrush increases. Range can be seeded if range condition is poor Siberian and crested wheatgrass, Russian wildrye, and Whitmar bluebunch wheatgrass are some adapted plants suitable for reseeding. There is a moderate to high chance that seeding will fail because of droughtiness. Fall seeding achieves the best results. Brush management is desirable if the amount of brush is excessive. Capability subclass VIe nonirrigated and IIc irrigated.

43-Pocatello silt loam, 1 to 3 percent slopes. This is a deep, well drained soil on broad loess uplands. Elevation ranges from 4,100 to 4,600 feet. This soil formed in loess. Average annual precipitation is about 9 inches, average annual air temperature is about 49 degrees F, and the frost-free season is 120 to 140 days.

Included with this soil in mapping is Portneuf silt loam on uplands and Rad silt loam in depressions. Also included is Garbutt silt loam in areas where this soil is associated with saline-alkali soils. The included soils have 1 to 3 percent slopes, and each makes up 5 percent of the map unit.

In a typical profile the soil is pale brown and very pale brown silt loam to a depth of 60 inches. The soil is calcareous and is moderately alkaline and strongly alkaline.

Permeability is moderate. Effective rooting depth is 40 to 60 inches or more. Available water capacity is 8 to 12 inches. If the soil is irrigated, surface runoff is medium and the hazard of erosion is moderate. Under natural conditions, surface runoff is slow and the hazard of erosion is moderate. The hazard of soil blowing is slight.

This soil is used for irrigated crops, for wildlife habitat, and for range. Irrigated crops are sugar beets, alfalfa hay, pasture, wheat, barley, dry beans, and potatoes. Alfalfa responds to phosphorous fertilizer, and all other crops respond to both nitrogen and phosphorous fertilizers. Crop rotation should provide for a balance between such soil-depleting crops as sugar beets and such soilbuilding crops as alfalfa. To maintain good soil tilth, it is important to return crop residue or add manure to the soil.

Irrigation methods suited to this soil are furrow, corrugation, and sprinkler. The length of run and the rate and time of application is determined by the 1 to 3 percent slopes and the moderate permeability of this soil.

If this soil is irrigated, it is well suited to habitat for ring-necked pheasant, Hungarian partridge, mourning dove, and nongame birds. Openland habitat can be improved by leaving grassland undisturbed and by planting shrubs and trees for nesting sites and cover. Unharvested crops furnish feed. Where this soil is not irrigated, it supports a limited number of predators, nongame birds, and cottontail. Many mourning doves use areas of this soil during migration.

As range condition deteriorates, perennial grasses and other desirable plants decrease and sagebrush increases. Range can be seeded if range condition is poor. Siberian and crested wheatgrass, Russian wildrye, and Whitmar bluebunch wheatgrass are some adapted plants suitable for reseeding. There is a moderate to high chance that seeding will fail because of droughtiness. Fall seeding achieves the best results. Brush management is desirable if the amount of brush is excessive. Capability subclass VIe nonirrigated and IIe irrigated.

44-Pocatello silt loam, 3 to 12 percent slopes. This is a deep, well drained soil on broad loess uplands. Elevation ranges from 4,200 to 5,000 feet. This soil formed in loess. Average annual precipitation is about 9 inches, average annual air temperature is about 49 degrees F, and the frost-free season is 110 to 140 days.

Included with this soil in mapping is Portneuf silt loam, 7 to 12 percent slopes, on uplands, and Neeley silt loam, 4 to 12 percent slopes, at higher elevations. These included soils each make up 5 percent of the map unit.

In a typical profile the soil is pale brown and very pale brown silt loam to a depth of 60 inches. The soil is calcareous and is moderately alkaline and strongly alkaline.

Permeability is moderate. Effective rooting depth is 40 to 60 inches or more. Available water capacity is 8 to 12 inches. If the soil is irrigated, surface runoff is rapid and the hazard of erosion is very high. Under natural conditions, surface runoff is slow and the hazard of erosion is moderate. The hazard of soil blowing is slight.

This soil is used for cultivated crops, for wildlife habitat, and for range. Irrigated crops are alfalfa hay, pasture, wheat, barley, and potatoes. Alfalfa responds to phosphorous fertilizer, and all other crops respond to both nitrogen and phosphorous fertilizers. Crop rotation should provide for a balance between such soil-depleting crops as sugar beets, and such soil-building crops as alfalfa. To maintain good soil tilth, it is important to return crop residue or add manure to the soil.

The irrigation method best suited to this soil is sprinkler. Furrow and corrugation methods can be used, but they require extensive land shaping. The length of run and the rate and time of application is determined by the 3 to 12 percent slopes and the moderate permeability of this soil.

If this soil is irrigated, it is well suited to habitat for ring-necked pheasant, Hungarian partridge, mourning dove, and nongame birds. Openland habitat can be improved by leaving grassland undisturbed and by planting shrubs and trees for nesting sites and cover. Unharvested crops furnish feed. Where this soil is not irrigated, it supports a limited number of predators, nongame birds, and cottontail. Many mourning doves use areas of this soil during migration.

As range condition deteriorates, perennial grasses and other desirable plants decrease and sagebrush increases. Range can be seeded if range condition is poor. Siberian and crested wheatgrass, Russian wildrye, and Whitmar bluebunch wheatgrass are some adapted plants suitable for reseeding. There is a moderate to high chance that seeding will fail because of droughtiness. Fall seeding achieves the best results. Brush management is desirable if the amount of brush is excessive. Capability subclass VIe nonirrigated and IVe irrigated.

45-Pocatello silt loam, 12 to 30 percent slopes. This is a deep, well drained soil on broad loess uplands. Elevation ranges from 4,600 to 5,200 feet. This soil formed in loess. Average annual precipitation is about 11 inches, average annual air temperature is about 47 degrees F, and the frost-free season is 110 to 140 days.

Included with this soil in mapping is Kucera silt loam, 12 to 30 percent slopes, on north-facing slopes. This included soil makes up about 10 percent of the total unit.

In a typical profile the soil is light brownish gray and light gray silt loam to a depth of 60 inches. The soil is calcareous and is moderately alkaline and strongly alkaline.

Permeability is moderate. Effective rooting depth is 40 to 60 inches or more. Available water capacity is 8 to 12 inches. Surface runoff is medium, and the hazard of erosion is high. The hazard of soil blowing is slight.

This soil is used for range and for wildlife habitat. It supports a limited number of chukar, quail, predators, and cottontail. Many mourning doves use areas of this soil during migration. The steep slopes prevent water development which is essential for wetland wildlife. This habitat has high potential for mule deer winter range. Proper grazing use and restricted brush control are beneficial to mule deer.

As range condition deteriorates, perennial grasses and more desirable plants decrease and sagebrush increases. Range can be reseeded if range condition is poor. Siberian and crested wheatgrass, Russian wildrye, and Whitmar bluebunch wheatgrass are some adapted plants suitable for reseeding. There is a moderate to high chance that seeding will fail because of droughtiness. Fall seeding achieves the best results. Brush management is desirable if the amount of brush is excessive. Capability subclass VIe nonirrigated.

46-Portneuf silt loam, 0 to 1 percent slopes. This is a deep, well drained soil on uplands. Elevation ranges from 4,100 to 4,500 feet. This soil formed in loess and lacustrine deposits. Average annual precipitation is about 9 inches, average annual air temperature is about 49 degrees F, and the frost-free season is 120 to 140 days.

Included with this soil in mapping is Neeley silt loam in slight depressions that receive runoff. This included soil makes up 5 percent of the total unit. It has 0 to 1 percent slopes.

In a typical profile the surface layer is light brownish gray silt loam about 10 inches thick. The subsoil is very pale brown silt loam about 4 inches thick. The substratum is very pale brown and light gray silt loam to a depth of 60 inches. The soil is calcareous, and has a layer of strong lime accumulation between a depth of 14 and 41 inches. This layer also has about 30 percent hard, cemented nodules. The soil is moderately alkaline to a depth of 23 inches and is strongly alkaline below that.

Permeability is moderate. Effective rooting depth is 60 inches or more. Available water capacity is 8 to 10 inches. Surface runoff is slow, and the hazards of erosion and soil blowing are slight.

This soil is used for irrigated crops, wildlife habitat, and range. irrigated crops are alfalfa hay, pasture, corn, potatoes, dry beans, sugar beets, barley, and wheat. Nitrogen fertilizer is used on all crops except alfalfa, and phosphorous fertilizer is used on all crops. To maintain good soil tilth and high yields, it is necessary to return organic matter to the soil and to rotate crops. Suitable organic matter can be crop residue or manure. Crop rotation should provide for a balance between such soil-depleting crops as sugar beets, and such soil-building crops as alfalfa.

Irrigation methods suited to this soil are furrow, corrugation, border, and sprinkler. The system used should be designed to replenish the moisture supply in the root zone without causing excessive surface runoff or deep percolation.

If this soil is irrigated, it is well suited to habitat for ring-necked pheasant, Hungarian partridge, mourning dove, and nongame birds. Openland habitat can be improved by leaving grassland undisturbed and by planting shrubs and trees for nesting sites and cover. Unharvested crops furnish feed. Where this soil is not irrigated, it supports a limited number of predators, nongame birds, and cottontail. Many mourning doves use areas of this soil during migration.

As range condition deteriorates, perennial grasses and other desirable plants decrease and sagebrush increases. Range can be seeded if range condition is poor. Siberian and crested wheatgrass, Russian wildrye, and Whitmar bluebunch wheatgrass are some adapted plants suitable for reseeding. There is a moderate to high chance that seeding will fail because of droughtiness. Fall seeding achieves the best results. Brush management is desirable if the amount of brush is excessive.

This soil is used for homesites and roads in rural areas. Because of low strength and moderate potential frost action, special design considerations are required. Capability subclass VIe nonirrigated and IIc irrigated.

47-Portneuf silt loam, 1 to 3 percent slopes. This is a deep, well drained soil on uplands. Elevation ranges from 4,100 to 4,500 feet. This soil formed in loess and lacustrine deposits. Average annual precipitation is about 9 inches, average annual air temperature is about 49 degrees F, and the frost-free season is 110 to 140 days.

Included with this soil in mapping is Rad silt loam, 1 to 3 percent slopes, in areas that receive runoff. This included soil makes up 5 percent of the total unit.

In a typical profile the surface layer is light brownish gray silt loam about 10 inches thick. The subsoil is very pale brown silt loam about 4 inches thick. The substratum is very pale brown and light gray silt loam to a depth of 60 inches. The soil is noncalcareous to a depth of 14 inches and is calcareous below that. The substratum has a layer of strong lime accumulation between a depth of 14 and 41 inches. This layer has about 20 percent hard, cemented nodules. The soil is mildly alkaline and moderately alkaline to a depth of 28 inches and is strongly alkaline below that.

Permeability is moderate. Effective rooting depth is 60 inches or more. Available water capacity is 8 to 10 inches. In irrigated areas, surface runoff is medium and the hazard of erosion is moderate. Under natural conditions surface runoff is slow and the hazards of erosion and soil blowing are slight.

This soil is used for irrigated crops, wildlife habitat, and range. Irrigated crops are alfalfa hay, pasture, corn, potatoes, dry beans, sugar beets, wheat, and barley. Nitrogen fertilizer is used on all crops except alfalfa, and phosphorous fertilizer is used on all crops. To maintain good soil tilth and high yields, it is necessary to return organic matter to the soil and to rotate crops. Suitable organic matter is crop residue or manure. Crop rotation should provide for a balance between such soil-depleting crops as sugar beets, and such soil-building crops as alfalfa.

Irrigation methods suited to this soil are furrow, corrugation, or sprinkler. The system used should be designed to fit crop needs and to conserve water. Surface irrigation systems should be designed so that water runs across the slope as much as possible.

If this soil is irrigated, it is well suited to habitat for ring-necked pheasant, Hungarian partridge, mourning dove, and nongame birds. Openland habitat can be improved by leaving grassland undisturbed and by planting shrubs and trees for nesting sites and cover. Unharvested crops furnish feed. Where this soil is not irrigated, it supports a limited number of predators, nongame birds, and cottontail. Many mourning doves use areas of this soil during migration.

As range condition deteriorates, perennial grasses and other desirable plants decrease and sagebrush increases. Range can be seeded if range condition is poor. Siberian and crested wheatgrass, Russian wildrye, and Whitmar bluebunch wheatgrass are some adapted plants suitable for reseeding. There is a moderate to high chance that seeding will fail because of droughtiness. Fall seeding achieves the best results. Brush management is desirable if the amount of brush is excessive.

This soil is used for homesites and roads in rural areas. Because of low strength and moderate potential frost action, special design considerations are required. Capability subclass VIe nonirrigated and IIe irrigated.

48-Portneuf silt loam, 3 to 7 percent slopes. This is a deep, well drained soil on uplands. Elevation ranges from 4,100 to 4,500 feet. This soil formed in loess and lacustrine deposits. Average annual precipitation is about 9 inches, average annual air temperature is about 49 degrees F, and the frost-free season is 110 to 140 days.

Included with this soil in mapping is Neeley silt loam, 4 to 12 percent slopes, on north-facing slopes. This included soil makes up 5 percent of the total unit.

In a typical profile the surface layer is light brownish gray silt loam about 10 inches thick. The subsoil is very pale brown silt loam about 4 inches thick. The substratum is very pale brown and light gray silt loam to a depth of 60 inches. This soil is calcareous and has a layer of strong lime accumulation between a depth of 14 and 32 inches. This layer has about 20 percent hard, cemented nodules. The soil is moderately alkaline to a depth of 14 inches and is strongly alkaline below that.

Permeability is moderate. Effective rooting depth is 60 inches or more. Available water capacity is 8 to 10 inches. In irrigated areas, surface runoff is medium and the hazard of erosion is high. Under natural conditions, surface runoff is medium and the hazard of erosion is moderate. The hazard of soil blowing is slight.

This soil is used for irrigated crops, wildlife habitat, and range. Irrigated crops are alfalfa hay, pasture, corn, potatoes, dry beans, sugar beets, barley, and wheat. Nitrogen fertilizer is used on all crops except alfalfa, and phosphorous fertilizer is used on all crops. To maintain good soil tilth and high yields, it is necessary to return organic matter to the soil and to rotate crops. Suitable or-

ganic matter is crop residue or manure. Crop rotation should provide for a balance between such soil-depleting crops as sugar beets, and such soil-building crops as alfalfa.

Irrigation methods suited to this soil are furrow, corrugation, and sprinkler. Surface irrigation systems should be designed so that water runs across the slope. This soil is well suited to sprinkler irrigation.

If this soil is irrigated, it is well suited to habitat for ring-necked pheasant, Hungarian partridge, mourning dove, and nongame birds. Openland habitat can be improved by leaving grassland undisturbed and by planting shrubs and trees for nesting sites and cover. Unharvested crops furnish feed. Where this soil is not irrigated, it supports a limited number of predators, nongame birds, and cottontail. Many mourning doves use areas of this soil during migration.

As range condition deteriorates, perennial grasses and other desirable plants decrease and sagebrush increases. Range can be seeded if range condition is poor. Siberian and crested wheatgrass, Russian wildrye, and Whitmar bluebunch wheatgrass are some adapted plants suitable for reseeding. There is a moderate to high chance that seeding will fail because of droughtiness Fall seeding achieves the best results. Brush management is desirable if the amount of brush is excessive.

This soil is used for homesites and roads in rural areas. Because of low strength and moderate potential frost action, special design considerations are required. Capability subclass VIe nonirrigated and IIIe irrigated.

49-Portneuf silt loam, 7 to 12 percent slopes. This is a deep, well drained soil on uplands. Elevation ranges from 4,100 to 4,500 feet. This soil formed in loess and lacustrine deposits. Average annual precipitation is about 9 inches, average annual air temperature is about 49 degrees F, and the frost-free season is 110 to 140 days.

Included with this soil in mapping is Neeley silt loam, 4 to 12 percent slopes, with north-facing slopes. This included soil makes up 5 percent of the total unit.

In a typical profile the surface layer is light brownish gray silt loam about 10 inches thick. The subsoil is very pale brown silt loam about 4 inches thick. The substratum is very pale brown and light gray silt loam to a depth of 60 inches. This soil is calcareous and has a layer of strong lime accumulation between a depth of 14 and 32 inches. This layer has about 20 percent hard, cemented nodules. The soil is moderately alkaline to a depth of 14 inches and is strongly alkaline below that.

Permeability is moderate. Effective rooting depth is 60 inches or more. Available water capacity is 8 to 12 inches. In irrigated areas, surface runoff is very rapid and the hazard of erosion is very high. Under natural conditions, surface runoff is medium and the hazard of erosion is moderate. The hazard of soil blowing is slight.

This soil is used for irrigated crops, wildlife habitat, and range. Irrigated crops are alfalfa hay, pasture, corn, potatoes, barley, and wheat. Nitrogen fertilizer is used on all crops except alfalfa, and phosphorous fertilizer is used on all crops. To maintain good soil tilth and high yields, it is necessary to return organic matter to the soil and to rotate crops. Suitable organic matter is crop residue or manure. Crop rotation should provide for a balance between such soil-depleting crops as potatoes, and such soil-building crops as alfalfa.

Irrigation methods suited to this soil are furrow, corrugation, and sprinkler. This soil is suited to most methods of irrigation. However, it is best suited to sprinkler irrigation because the other methods require extensive land leveling and soil moving.

If this soil is irrigated, it is well suited to habitat for ring-necked pheasant, Hungarian partridge, mourning dove, and nongame birds. Openland habitat can be improved by leaving grassland undisturbed, and by planting shrubs and trees for nesting sites and cover. Unharvested crops furnish feed. Where this soil is not irrigated, it supports a limited number of predators, nongame birds, and cottontail. Many mourning doves use areas of this soil during migration.

As range condition deteriorates, perennial grasses and other desirable plants decrease and sagebrush increases. Range can be reseeded if range condition is poor. Siberian and crested wheatgrass, Russian wildrye, and Whitmar bluebunch wheatgrass are some adapted plants suitable for reseeding. There is a moderate to high chance that seeding will fail because of droughtiness. Fall seeding achieves the best results. Brush management is desirable if the amount of brush is excessive. Capability subclass VIe nonirrigated and IVe irrigated.

50-Portneuf-Trevino complex. The soils in this unit are on basalt terraces. Elevation ranges from 4,100 to 4,700 feet. Portneuf silt loam that has slopes of 2 to 12 percent makes up 50 percent of this unit and is in areas between ridges. Trevino silt loam that has slopes of 2 to 20 percent makes up 30 percent of this unit and is on ridges. Average annual precipitation is about 9 inches, average annual air temperature is about 49 degrees F, and the frost-free season is 110 to 140 days.

The rest of this unit is Somsen fine sandy loam, Rad silt loam, Vining sandy loam, and Pocatello silt loam. Each makes up 5 percent of the map unit. These soils have slopes of 0 to 20 percent. Pocatello, Rad, and Vining soils are on ridges.

The Portneuf soil is deep and well drained and formed in alluvium derived from loess and lacustrine deposits. In a typical profile the surface layer is light brownish gray silt loam about 10 inches thick. The subsoil is very pale brown silt loam about 3 inches thick. The substratum is very pale brown and light gray silt loam. Bedrock is at a depth of 45 inches. This soil is calcareous. A layer that has strong lime accumulation and 20 percent hard, cemented nodules is between a depth of 10 and 32 inches. The soil is moderately alkaline to a depth of 13 inches and is strongly alkaline below that.

Permeability is moderate. Effective rooting depth is 40 to 60 inches. Available water capacity is 8 to 10 inches. In

irrigated areas, surface runoff is rapid and the hazard of erosion is very high. Under natural conditions, runoff is medium and the hazard of erosion is moderate. The hazard of soil blowing is slight.

The Trevino soil is shallow and well drained and formed in loess that overlies basalt bedrock. In a typical profile the surface layer is light gray silt loam 2 inches thick. The subsoil is pale brown silt loam 8 inches thick. The underlying material is very pale brown silt loam. Basalt bedrock is at a depth of 14 inches. This soil is mildly alkaline and moderately alkaline. It is calcareous and has a layer of lime accumulation between a depth of 8 and 14 inches.

Permeability is moderate. Effective rooting depth is 10 to 20 inches. Available water capacity is 1.8 to 3.5 inches. In irrigated areas, surface runoff is rapid and the hazard of erosion is very high. Under natural conditions, surface runoff is medium and the hazard of erosion is moderate. The hazard of soil blowing is moderate.

These soils are used for irrigated crops, wildlife habitat, and range. Irrigated crops are barley, wheat, alfalfa hay, and pasture. Alfalfa responds to phosphorous fertilizers, and all other crops respond to both phosphorous and nitrogen fertilizers. To maintain high yields and good soil tilth, crop residue should be returned to the soil. If the surface is unprotected, crop stubble or other kinds of organic matter can be used to protect the soil.

These soils are better suited to sprinkler irrigation than to other irrigation methods. The frequency of irrigation is based on the shallow rooting depth and the very low and low available water capacity in the Trevino soil. Irrigation water should be applied at a rate that will not cause accelerated erosion and that is based on permeability and slope of the soil.

If these soils are irrigated, they are well suited to habitat for ring-necked pheasant, Hungarian partridge, mourning dove, and nongame birds. Openland habitat can be improved by leaving grassland undisturbed and by planting shrubs and trees for nesting sites and cover. Unharvested crops furnish feed. Where these soils are not irrigated, they support a limited number of predators, nongame birds, and cottontail. Many mourning doves use areas of these soils during migration.

As range condition deteriorates on the Portneuf soil, perennial grasses and other desirable plants decrease and sagebrush increases. Range can be seeded if range condition is poor. Siberian and crested wheatgrass, Russian wildrye, and Whitmar bluebunch wheatgrass are some adapted plants suitable for reseeding. There is a moderate to high chance that seeding will fail because of droughtiness. Fall seeding achieves the best results. Brush management is desirable if the amount of brush is excessive.

As range condition deteriorates on the Trevino soil, bluebunch wheatgrass and Thurber needlegrass decrease and low sagebrush, forbs, and weedy annuals increase. Siberian and crested wheatgrass, Russian wild rye, and Whitmar bluebunch wheatgrass are some adapted plants suitable for reseeding. There is a moderate to high chance that seeding will fail because of droughtiness. Fall seeding achieves the best results. Brush management is desirable if the amount of brush is excessive. Capability subclass VIs nonirrigated and IVe irrigated.

51-Quincy loamy sand, 3 to 12 percent slopes. This is a deep, somewhat excessively drained soil on duned valley terraces. Elevation ranges from 4,100 to 4,500 feet. This soil formed in eolian sands blown out of water channels or other local sources. Average annual precipitation is about 9 inches, average annual air temperature is about 49 degrees F, and the frost-free season is 110 to 140 days.

Included with this soil in mapping is Vining sandy loam, 1 to 3 percent slopes, where this soil is associated with bedrock. This soil makes up about 5 percent of the total unit. Also included is Escalante sandy loam, 3 to 7 percent slopes, in depressions between dunes. This soil makes up 10 percent of the unit.

In a typical profile the soil is pale brown, very pale brown, and light gray loamy sand and loamy fine sand to a depth of 41 inches. Below this is light gray fine sandy loam to a depth of 60 inches. The soil is calcareous and is moderately alkaline.

Permeability is rapid. Effective rooting depth is 60 inches or more. Available water capacity is 2.5 to 5 inches. Surface runoff is very slow, and the hazard of erosion is high. The hazard of soil blowing is very high.

This soil is used for cultivated crops, for wildlife habitat, and for range. Irrigated crops are potatoes, dry beans, alfalfa hay, pasture, barley, and wheat. The most desirable cropping system for this soil is one that provides protection for the surface all year, for example, continuous hay or pasture. If this soil is used for such crops as potatoes or dry beans, a well anchored cover of plant litter should be left on the surface to protect against soil blowing. All crops respond to phosphorous and nitrogen fertilizers except alfalfa which responds only to phosphorous fertilizer. Fertilizer should be applied 2 or 3 times a year in small amounts to avoid leaching losses.

This soil is adaptable to most kinds of irrigation, but the sprinkler method gives the best results. To insure good use of water and avoid plant stress caused by lack of water, it is necessary to make frequent, light water applications.

If this soil is irrigated, it is well suited to habitat for ring-necked pheasant, Hungarian partridge, mourning dove, and nongame birds. Openland habitat can be improved by leaving grassland undisturbed and by planting shrubs and trees for nesting sites and cover. Unharvested crops furnish feed. Where this soil is not irrigated, it supports a limited number of upland birds and cottontail. Many mourning doves use areas of this soil during migration.

As range condition deteriorates, Indian ricegrass, Thurber needlegrass, and bluebunch wheatgrass decrease and big sagebrush, horsebrush, and rabbitbrush increase. If the range continues to deteriorate, sand dunes start to form. Grazing management is essential if the range is

grazed by livestock. Reseeding is very hazardous and not recommended except to stabilize already depleted areas. Seeding failure is extremely high. Indian ricegrass and yellow wildrye are some of the adapted plants. Brush management generally is not recommended. Capability subclass VIIe nonirrigated and IVe irrigated.

52-Rad silt loam, 1 to 3 percent slopes. This is a deep, well drained soil on terraces. Elevation ranges from 4,300 to 4,500 feet. This soil formed in alluvium derived from loess deposits. Average annual precipitation is about 9 inches, average annual air temperature is about 49 degrees F, and the frost-free season is 110 to 130 days.

Included with this soil in mapping is Kimama silt loam that has 0 to 2 percent slopes and Neeley silt loam, 4 to 12 percent slopes. The Kimama soil is in areas that receive runoff, and the Neeley soil is on north-facing slopes. Each of these soils makes up 5 percent of the total unit.

In a typical profile the surface layer is light brownish gray and grayish brown silt loam and very fine sandy loam 7 inches thick. The subsoil is light brownish gray and light gray loam and silt loam 16 inches thick. This is underlain by pale brown and light gray silt loam to a depth of 60 inches or more. The soil is mildly alkaline and moderately alkaline to a depth of 42 inches and is strongly alkaline below that. It is noncalcareous to a depth of 23 inches and is calcareous below that. Weak silica cementation is between a depth of 23 and 42 inches.

Permeability is slow. Effective rooting depth is 40 to 60 inches or more. Available water capacity is 8 to 12 inches. In irrigated areas, surface runoff is medium and the hazard of erosion is moderate. Under natural conditions surface runoff is slow and the hazards of erosion and soil blowing are slight.

This soil is used for irrigated crops, for wildlife habitat, and for range. Irrigated crops are alfalfa hay, pasture, corn, dry beans, potatoes, sugar beets, barley, and wheat. Nitrogen fertilizer is used on all crops except alfalfa, and phosphorous fertilizer is used on all crops To maintain good soil tilth and high yields, it is necessary to return organic matter to the soil and to rotate crops. Suitable organic matter is crop residue or manure. Crop rotation should provide for a balance between such soil-depleting crops as sugar beets, and such soil-building crops as alfalfa.

Irrigation methods suited to this soil are furrow, corrugation, and sprinkler. The system used should be designed so that water enters the soil with a minimum flow over the surface, because large surface flows cause accelerated erosion. The frequency of irrigation must be based on the available water capacity of this soil.

If this soil is irrigated, it is well suited to habitat for ring-necked pheasant, Hungarian partridge, mourning dove, and nongame birds. Openland habitat can be improved by leaving grassland undisturbed and by planting shrubs and trees for nesting sites and cover. Unharvested crops furnish feed. Where this soil is not irrigated, it supports a limited number of predators, nongame birds, and cottontail. Many mourning doves use areas of this soil during migration.

As range condition deteriorates, perennial grasses and other desirable plants decrease and sagebrush increases. Range can be seeded if range condition is poor. Siberian and crested wheatgrass, Russian wildrye, and Whitmar bluebunch wheatgrass are some adapted plants suitable for reseeding. There is a moderate to high chance that seeding will fail because of droughtiness. Fall seeding achieves the best results. Brush management is desirable if the amount of brush is excessive. Capability subclass VIe nonirrigated and IIe irrigated.

53-Reywat cobbly loam, 0 to 30 percent slopes. This is a shallow, well drained soil on mountain ridges and terraces (fig. 13). Elevation ranges from 5,000 to 6,000 feet. This soil formed in material recently decomposed from quartz latite. Average annual precipitation is about 13 inches, average annual air temperature is about 46 degrees F, and the frost-free season is 90 to 110 days.

Included with this soil in mapping is Itca stony sandy loam, 3 to 20 percent slopes, at higher elevations and Mackey very stony loam that has 8 to 30 percent slopes, on escarpments or terraces. A few small areas of Rock outcrop are also included. Itca stony sandy loam makes up about 5 percent of the total map unit, and Mackey very stony loam makes up 10 percent.

In a typical profile the surface layer is brown cobbly loam 3 inches thick. The subsoil is brown and pale brown gravelly clay loam and very cobbly clay loam 13 inches thick. Bedrock is below this. The soil is mildly alkaline and is noncalcareous.

Permeability is moderately slow. Effective rooting depth is 10 to 20 inches. Available water capacity is 0.8 to 2.5 inches. Surface runoff is medium and rapid, and the hazard of erosion is high. The hazard of soil blowing is slight.

This soil is used for range and for wildlife habitat. The inclusion of small pockets of brushy areas makes this area desirable for mule deer. Steep slopes prevent wetland development. This area is important to some nongame birds but is undesirable for pheasants because of high elevations; long, cold winters; and lack of cropland. This habitat also supports a limited number of chukar and partridge.

As range condition deteriorates, bluebunch wheatgrass and Idaho fescue decrease and low sagebrush and forbs increase. Juniper also invades this site. Range can be reseeded with adapted grasses if range condition is poor. Siberian and crested wheatgrass, Russian wildrye, and Whitmar bluebunch wheatgrass are some adapted plants suitable for reseeding. There is a moderate to high chance that seeding will fail because of droughtiness. Fall seeding achieves the best results. Brush management is desirable if the amount of brush is excessive. Capability subclass VIs nonirrigated.

54-Scoon-Rock outcrop complex. The soil and miscellaneous area in this unit are on igneous hills. Elevation ranges from 4,300 to 4,700 feet. Scoon silt loam that has

slopes of 1 to 20 percent makes up 65 percent of this unit and is on hillsides. Rock outcrop is bare igneous rock and makes up 20 percent and is on escarpments, ridges, and hilltops.

The rest of this unit is Buko loam that has 2 to 4 percent slopes, on terraces; Taunton loam, 4 to 7 percent slopes, in drainageways or depressions; and Mulett very stony loam, 4 to 20 percent slopes, on ridgetops.

The Scoon soil is shallow and well drained and formed in material recently decomposed from mixed igneous rocks and overlying loess. Average annual precipitation is about 9 inches, average annual air temperature is about 49 degrees F, and the frost-free season is 110 to 135 days. In a typical profile the soil is light brownish gray and very pale brown silt loam and gravelly loam to a depth of 12 inches. Below this is an indurated hardpan. The soil is moderately alkaline and is calcareous.

Permeability is moderate. Effective rooting depth is 10 to 20 inches. Available water capacity is 1.5 to 3.0 inches. Surface runoff is medium, and the hazard of erosion is high. The hazard of soil blowing is slight.

The Scoon soil is used for range and for wildlife habitat, and the Rock outcrop is wasteland. This soil has very little value in producing a large number of wildlife game. Wildlife in the area is limited to small rodents and predators.

As range condition deteriorates, perennial grasses and other desirable plants decrease and sagebrush increases. Range can be seeded if range condition is poor. Liberian and crested wheatgrass, Russian wildrye, and Whitmar bluebunch wheatgrass are some adapted plants suitable for reseeding. There is a moderate to high chance that seeding will fail because of droughtiness. Fall seeding achieves the best results. Brush management is desirable if the amount of brush is excessive. Capability subclass VIs nonirrigated.

55-Scoon-Taunton complex. The soils in this unit are on old igneous hills. Elevation ranges from 4,400 to 4,900 feet. Scoon silt loam that has slopes of 0 to 30 percent makes up 50 percent of this unit and is on sides and tops of ridges. Taunton loam that has slopes of 1 to 12 percent makes up about 35 percent and is in broad drainageways and on terraces. Average annual precipitation is about 10 inches, average annual air temperature is about 48 degrees F, and the frost-free season is 110 to 130 days.

The rest of this unit is Rock outcrop; Pocatello silt loam, 12 to 30 percent slopes; and Trevino silt learn, 2 to 20 percent slopes. Each makes up 5 percent of the total map unit. Rock outcrop and the Trevino soil are on tops of hills and ridges. Pocatello silt loam is at lower elevations.

The Scoon soil is shallow and well drained and formed in material derived from recently decomposed mixed igneous rock and overlying loess. In a typical profile the soil is light brownish gray and very pale brown silt loam and gravelly loam to a depth of 12 inches. Below this is an indurated hardpan. The soil is moderately alkaline and is calcareous.

Permeability is moderate. Effective rooting depth is 10 to 20 inches. Available water capacity is 1.5 to 3.0 inches. Surface runoff is medium, and the hazard of erosion is high. The hazard of soil blowing is slight.

The Taunton soil is moderately deep and somewhat excessively drained and formed in alluvium derived from mixed sources. In a typical profile the surface layer is light brownish gray loam 7 inches thick. This is underlain by very pale brown and white sandy loam to a depth of 22 inches. The next layer is a silica cemented hardpan. This soil is moderately alkaline and is calcareous.

Permeability is moderately rapid. Effective rooting depth is 20 to 40 inches. Available water capacity is 3 to 6 inches. Surface runoff is slow and medium, and the hazard of erosion is slight and moderate. The hazard of soil blowing is slight.

These soils have very little value in producing a large number of wildlife and game. Wildlife in the area is limited to small rodents and predators.

As range condition deteriorates on the Scoon soil, bluebunch wheatgrass and Thurber needlegrass decrease and low sagebrush, forbs, and weedy annuals increase. Range can be seeded if range condition is poor. Siberian and crested wheatgrass, Russian wildrye, and Whitmar bluebunch wheatgrass are some adapted plants suitable for reseeding. There is a moderate to high chance that seeding will fail because of droughtiness. Fall seeding achieves the best results. Brush management is desirable if the amount of brush is excessive.

As range condition deteriorates on the Taunton soil, Indian ricegrass, Thurber needlegrass, and bluebunch wheatgrass decrease and big sagebrush, horsebrush, and rabbitbrush increase. Range can be seeded if range condition is poor. Siberian and crested wheatgrass, Russian wildrye, and Whitmar bluebunch wheatgrass are some adapted plants suitable for reseeding. There is a moderate to high chance that seeding will fail because of droughtiness. Fall seeding achieves the best results. Brush management is desirable if the amount of brush is excessive. Capability subclass VIs nonirrigated.

56-Somsen fine sandy loam, 3 to 7 percent slopes. This is a moderately deep, well drained soil on basalt plains. Elevation ranges from 4,200 to 4,500 feet. This soil formed in eolian material over basalt. Average annual precipitation is about 9 inches, average annual air temperature is about 49 degrees F, and the frost-free season is 120 to 140 days.

Included with this soil in mapping is a soil similar to the Somsen soil except it is loamy sand to bedrock. This included soil makes up about 10 percent of the total unit. Also included is Trevino silt loam and Rock outcrop. Each of these included soils makes up about 5 percent of the total unit. The included soils have 1 to 7 percent slopes.

In a typical profile the surface layer is grayish brown fine sandy loam 3 inches thick. The subsoil is pale brown fine sandy loam 8 inches thick. The next layer is pale brown and very pale brown gravelly fine sandy loam and gravelly loam to a depth of 27 inches. This is underlain by

basalt. The soil is moderately alkaline and is calcareous below a depth of 3 inches. A layer of strong lime accumulation is between a depth of 17 and 27 inches;.

Permeability is moderately rapid. Effective rooting depth is 20 to 40 inches. Available water capacity is 2 to 4 inches. Surface runoff is medium, and the hazards of erosion and soil blowing are high. The loamy sand inclusion has a very high hazard of soil blowing.

This soil is used for irrigated crops, for wildlife habitat, and for range. Irrigated crops are wheat, barley, sugar beets, potatoes, alfalfa hay, and pasture. Alfalfa responds to phosphorous fertilizers, and all other crops respond to both phosphorous and nitrogen fertilizers. To maintain high yields and good soil tilth, it is necessary to rotate crops. Crop rotation should provide for a balance between such soil-depleting crops as potatoes, and such soil-building crops as alfalfa. Because of the hazard of soil blowing the surface of this soil should be protected at all times. If the surface is unprotected, crop stubble or other kinds of organic matter can be used to protect the soil.

Irrigation methods suited to this soil are furrow, corrugation, and sprinkler. The soil is best suited to sprinkler irrigation. The system used requires frequent, light applications of water to produce crops at their best yields.

If this soil is irrigated, it is well suited to habitat for ring-necked pheasant, Hungarian partridge, mourning dove, and nongame birds. Openland habitat can be improved by leaving grassland undisturbed and by planting shrubs and trees for nesting sites and cover. Unharvested crops furnish feed. Where this soil is not irrigated, it supports a limited number of predators, nongame birds, and cottontail. Many mourning doves use areas of this soil during migration.

As range condition deteriorates, Indian ricegrass, Thurber needlegrass, and bluebunch wheat grass decrease and big sagebrush, horsebrush, and rabbitbrush increase. If the range continues to deteriorate sand dunes start to form. Grazing management is essential if grazed by livestock. Reseeding is very hazardous and not recommended except to stabilize already depleted areas. Seeding failure is extremely high. Indian ricegrass and yellow wildrye are some of the adapted plants. Brush management generally is not recommended. Capability subclass VIIe nonirrigated and IIIe irrigated.

57-Somsen-Rock outcrop complex. the soil and miscellaneous area in this unit are in hilly areas. Elevation ranges from 4,200 to 4,600 feet. Somsen fine sandy loam that has slopes of 3 to 20 percent maces up 65 percent of this unit and is on sides and tops of ridges. Rock outcrop makes up 20 percent of the unit and occurs on ridgetops and as outcropping on sides. It is bare igneous rock.

The rest of this unit includes a soil similar to the Somsen soil except it is loamy sand above the bedrock and is on ridgesides; Trevino silt loam that has 2 to 20 percent slopes, on ridgetops; and Pocatello silt loam, 3 to 12 percent slopes, on north-facing ridgesides.

The Somsen soil is moderately deep and well drained and formed in eolian material over basalt bedrock. Average annual precipitation is about 9 inches, average annual air temperature is about 49 degrees F, and the frost-free season is 120 to 140 days. In a typical profile the surface layer is grayish brown fine sandy loam 3 inches thick. The subsoil is pale brown fine sandy loam 8 inches thick. The next layer is pale brown and very pale brown gravelly fine sandy loam to a depth of 27 inches. This is underlain by basalt. The soil is moderately alkaline and is calcareous below a depth of 3 inches. A layer of strong lime accumulation is between a depth of 17 and 27 inches.

Permeability is moderately rapid. Effective rooting depth is 20 to 40 inches. Available water capacity is 2 to 4 inches. Surface runoff is medium, and the hazards of erosion and soil blowing are high. The loamy sand inclusion has a very high hazard of soil blowing.

The Somsen soil is used for irrigated crops, for wildlife habitat, and for range. Rock outcrop is wasteland. Irrigated crops are barley, wheat, sugar beets, potatoes, alfalfa hay, and pasture. Alfalfa responds to phosphorous fertilizer, and all other crops respond to phosphorous and nitrogen fertilizers. To maintain high yields and good soil tilth, it is necessary to rotate crops. Crop rotation should provide for a balance between such soil-depleting crops as potatoes, and such soil-building crops as alfalfa. Because of the hazard of soil blowing, the surface of this soil should be protected at all times. If the surface is unprotected, crop stubble or other kinds of organic matter can be used to protect the soil.

This soil is best suited to sprinkler irrigation. Other irrigation methods suited to this soil are furrow and corrugation. The system used requires frequent, light applications of water to produce crops at their best yields.

If this soil is irrigated, it is well suited to habitat for ring-necked pheasant, Hungarian partridge, mourning dove, and nongame birds. Openland habitat can be improved by leaving grassland undisturbed and by planting shrubs and trees for nesting sites and cover. Unharvested crops furnish feed. Where this soil is not irrigated, it supports a limited number of predators, nongame birds, and cottontail. Many mourning doves use areas of this soil during migration.

As range condition deteriorates, Indian ricegrass, Thurber needlegrass, and bluebunch wheatgrass decrease and big sagebrush, horsebrush, and rabbitbrush increase. If the range continues to deteriorate, sand dunes start to form. Grazing management is essential if grazed by livestock. Reseeding is very hazardous and not recommended except to stabilize already depleted areas. Seeding failure is extremely high. Indian ricegrass and yellow wildrye are some of the adapted plants. Brush management generally is not recommended. Capability subclass VIIe nonirrigated and IVe irrigated.

58-Taunton fine sandy loam, 1 to 7 percent slopes. This is a moderately deep, somewhat excessively drained soil on broad, old valley terraces. Elevation ranges from

4,100 to 4,300 feet. This soil formed in alluvium derived from mixed sources. Average annual precipitation is about 10 inches, average annual air temperature is about 49 degrees F, and the frost-free season is 120 to 140 days.

Included with this soil in mapping is Trevino silt loam, 1 to 7 percent slopes, and Scoon silt loam, 1 to 20 percent slopes, on ridges or in slightly elevated areas, and Portneuf silt loam, 1 to 3 percent slopes, in broad, more level areas. These included soils each make up about 5 percent of the total map unit. Also included is a soil similar to the Taunton soil except it is loamy very fine sand above the hardpan. This soil makes up about 10 percent of the unit.

In a typical profile the surface layer is light brownish gray fine sandy loam 3 inches thick. This is underlain by pale brown and very pale brown sandy loam and loam to a depth of 27 inches. The next layer is a silica-cemented hardpan. The soil is moderately alkaline below a depth of 3 inches. It is noncalcareous to a depth of 15 inches and is calcareous below that. A layer of lime accumulation is between a depth of 20 and 27 inches.

Permeability is moderately rapid. Effective rooting depth is 20 to 40 inches. Available water capacity is 2.5 to 5 inches. In irrigated areas, surface runoff is rapid and the hazard of erosion is high. Under natural conditions, surface runoff is medium and the hazard of erosion is moderate. The hazard of soil blowing is high except in the loamy very fine sand in the Jackson area where ii; is very high.

This soil is used for cultivated crops, for wildlife habitat, and for range. Irrigated crops are alfalfa hay, pasture, corn, potatoes, sugar beets, wheat, and barley. All crops respond to phosphorous fertilizer, and all crops except alfalfa respond to nitrogen fertilizer. To maintain high yields and good soil tilth, it is necessary to rotate crops. Crop rotation should provide for a balance between such soil-depleting crops as potatoes, and such soil-building crops as alfalfa. Also it is necessary to return organic matter to the soil. Suitable organic matter is crop residue or manure. To avoid destroying the natural aggregating tendencies of this soil, it is important to keep tillage operations to a minimum. The soil should have a protective surface cover during winter and spring to reduce soil blowing.

Most irrigation methods could be used on this soil but the sprinkler method is the best suited. The rate and frequency of application must be adjusted to account for the lower available water capacity of the soil and the slopes.

If this soil is irrigated, it is well suited to habitat for ring-necked pheasant, Hungarian partridge, mourning dove, and nongame birds. Openland habitat can be improved by leaving grassland undisturbed and by planting shrubs and trees for nesting sites and cover. Unharvested crops furnish feed. Where this soil is not irrigated, it supports a limited number of predators, nongame birds, and cottontail. Many doves use areas of this soil during migration.

As range condition deteriorates, Indian ricegrass, Thurber needlegrass, and bluebunch wheatgrass decrease and big sagebrush, horsebrush, and rabbitbrush increase. If the range continues to deteriorate, sand dunes start to form. Grazing management is essential if grazed by livestock. Reseeding is hazardous but can be done if caution is used to control soil blowing. Seeding failure is moderate to high. Siberian wheatgrass, Indian ricegrass, and yellow wildrye are some of the adapted plants. Brush management generally is not recommended. Capability subclass VIe nonirrigated and IVe irrigated.

59-Taunton loam, 0 to 2 percent slopes. This is a moderately deep, somewhat excessively drained soil on broad, old valley terraces. Elevation ranges from 4,200 to 4,500 feet. This soil formed in alluvium derived from mixed sources. Average annual precipitation is about 10 inches, average annual air temperature is about 49 degrees F, and the frost-free season is 120 to 140 days.

Included with this soil in mapping is Trevino silt loam, 1 to 7 percent slopes, and Scoon silt loam that has 1 to 20 percent slopes. Both are on ridges or in slightly elevated areas. Also included is Portneuf silt loam, 1 to 3 percent slopes, in broad, more level areas. These included soils each make up about 5 percent of the total unit.

In a typical profile the surface layer is light brownish *gray* loam 5 inches thick. This is underlain by light gray and very pale brown loam and sandy loam to a depth of 24 inches. The next layer is a silica-cemented hardpan. The soil is moderately alkaline and is calcareous.

Permeability is moderately rapid. Effective rooting depth is 20 to 40 inches. Available water capacity is 3 to 6 inches. Surface runoff is slow, and the hazards of erosion and soil blowing are slight.

This soil is used for cultivated crops, for wildlife habitat, and for range. Irrigated crops are alfalfa hay, pasture, corn, potatoes, sugar beets, wheat, and barley. All crops respond to phosphorous fertilizer, and all crops except alfalfa respond to nitrogen fertilizer. To maintain high yields and good soil tilth, it is important to rotate crops and to return organic matter to the soil. Crop rotation should provide for a balance between such soil-depleting crops as potatoes, and such soil-building crops as alfalfa. Suitable organic matter can be crop residue or manure. To avoid destroying the natural aggregating tendencies of this soil, it is important to keep tillage operations to a minimum.

Irrigation methods suited to this soil are furrow, border, corrugation, or sprinkler. The rate and frequency of application must be adjusted to account for lower available water capacity of this soil.

If this soil is irrigated, it is well suited to habitat for ring-necked pheasant, Hungarian partridge, mourning dove, and nongame birds. Openland habitat can be improved by leaving grassland undisturbed and by planting shrubs and trees for nesting sites and cover. Unharvested crops furnish feed. Where this soil is not irrigated, it supports a limited number of predators, nongame birds, and cottontail. Many mourning doves use areas of this soil during migration.

As range condition deteriorates, Thurber needlegrass, and bluebunch wheatgrass decrease; big sagebrush, and rabbitbrush increase. Range can be seeded if range condition is poor. Siberian and crested wheatgrass, Russian wildrye and Whitmar bluebunch wheatgrass are some adapted plants suitable for reseeding. There is a moderate to high chance that seeding will rail because of droughtiness. Fall seeding achieves the best results. Brush management is desirable if the amount of brush is excessive. Capability subclass VIe nonirrigated and IIs irrigated.

60-Taunton loam, 2 to 4 percent slopes. This is a moderately deep, somewhat excessively drained soil on broad, old valley terraces. Elevation ranges from 4,100 to 4,500 feet. This soil formed in alluvium derived from mixed sources. Average annual precipitation is about 10 inches, average annual air temperature is about 49 degrees F, and the frost-free season is 120 to 140 days.

Included with this soil in mapping is Trevino silt loam, 1 to 7 percent slopes, and Scoon silt loam that has 1 to 20 percent slopes, on ridges or in slightly elevated areas, and Portneuf silt loam, 1 to 3 percent slopes, in broad uniform areas. These included soils each make up a about 5 percent of the total map unit.

In a typical profile the surface layer is pale brown loam 5 inches thick. This is underlain by white and very pale brown sandy loam to a depth of 24 inches. The next layer is a silica-cemented hardpan. The soil is moderately alkaline and is calcareous.

Permeability is moderately rapid. Effective rooting depth is 20 to 40 inches. Available water capacity is 3 to 6 inches. In irrigated areas, surface runoff is slow and the hazard of erosion is moderate. Under natural conditions, surface runoff is slow and the hazards of erosion and soil blowing are slight.

This soil is used for cultivated crops, for wildlife habitat, and for range. Irrigated crops are alfalfa hay, pasture, corn, potatoes, sugar beets, wheat, and barley. All crops respond to phosphorous fertilizer, and all crops except alfalfa respond to nitrogen fertilizer. To maintain high yields and good soil tilth, it is important to rotate crops and return organic matter to the soil. Crop rotation should provide for a balance between such soil-depleting crops as potatoes and such soil-building crops as alfalfa. Organic matter can be crop residue or manure. To avoid destroying the natural aggregating tendencies of this soil, it is important to keep tillage operations to a minimum.

Irrigation methods suited to this soil are furrow, corrugation, and sprinkler. The rate and frequency of application must be adjusted to account for the lower available water capacity of this soil. If a surface irrigation method is used, it must be designed to avoid cuts of more than 10 inches when the land is leveled.

If this soil is irrigated, it is well suited to ring-necked pheasant, Hungarian partridge, mourning dove, and nongame birds. Openland habitat can be improved by leaving grassland undisturbed and by planting shrubs and trees for nesting sites and cover. Unharvested crops furnish feed. Where this soil is not irrigated, it supports a limited number of predators, nongame birds, and cottontail. Many mourning doves use areas of this soil during migration.

As range condition deteriorates, Thurber needlegrass, and bluebunch wheatgrass decrease and big sagebrush, horsebrush, and rabbitbrush increase. Range can be seeded if range condition is poor. Siberian and crested wheatgrass, Russian wildrye and Whitmar bluebunch wheatgrass are some adapted plants suitable for reseeding. There is a moderate to high chance that seeding will fail because of droughtiness. Fall seeding achieves the best results. Brush management is desirable if the amount of brush is excessive. Capability subclass VIe nonirrigated and IIIe irrigated.

61-Taunton loam, 4 to 7 percent slopes. This is a moderately deep, somewhat excessively drained soil on broad, old valley terraces. Elevation ranges from 4,100 to 4,900 feet. This soil formed in alluvium derived from mixed sources. Average annual precipitation is about 10 inches, average annual air temperature is about 49 degrees F, and the frost-free season is 110 to 140 days.

Included with this soil in mapping is Trevino silt loam, 1 to 7 percent slopes, and Scoon silt loam that has 1 to 20 percent slopes, on ridges or in slightly elevated areas, and Buko loam, 2 to 4 percent slopes, in drainageways. These included soils each make up about 5 percent of the total map unit. Also included in the Jackson area is a soil similar to the Taunton soil except it is loamy very fine sand over the hardpan. This soil makes up about 10 percent of the map unit.

In a typical profile the surface layer is pale brown and very pale brown loam 5 inches thick. This is underlain by very pale brown and white sandy loam to a depth of 24 inches. The next layer is a silica-cemented hardpan. The soil is moderately alkaline and is calcareous.

Permeability is moderately rapid. Effective rooting depth is 20 to 40 inches. Available water capacity is 3 to 6 inches. In irrigated areas, surface runoff is rapid and the hazard of erosion is high. Under natural conditions, surface runoff is medium and the hazard of erosion is moderate. The hazard of soil blowing is moderate except for the included loamy very fine sand in the Jackson area where it is very high.

This soil is used for cultivated crops, for wildlife habitat, and for range. Irrigated crops are alfalfa hay, pasture, corn, potatoes, sugar beets, wheat, and barley. All crops respond to nitrogen fertilizer. To maintain high yields and good soil tilth, it is necessary to return organic matter to the soil and to rotate crops. Suitable organic matter is crop residue or manure. Crop rotation should provide for a balance between such soil-depleting crops as potatoes, and such soil-building crops as alfalfa. To avoid destroying the natural aggregating tendencies of this soil, it is important to keep tillage operations to a minimum.

Irrigation methods suited to this soil are furrow, corrugation, and sprinkler. The rate and frequency of application must be adjusted to account for the lower available water capacity of the soil and to account for the slopes.

This soil is easier to manage with the sprinkler irrigation method than with the surface method which requires land leveling. All cuts should be less than 10 inches because of the hardpan in the soil.

If this soil is irrigated, it is well suited to habitat for ring-necked pheasant, Hungarian partridge, mourning dove, and nongame birds. Openland habitat can be improved by leaving grassland undisturbed and by planting shrubs and trees for nesting sites and cover. Unhavested crops furnish feed. Where this soil is not irrigated, it supports a limited number of predators, nongame birds, and cottontail. Many mourning doves' use areas of this soil during migration.

As range condition deteriorates, Thurber needlegrass, and bluebunch wheatgrass decrease and big sagebrush, horsebrush, and rabbitbrush increase. Range can be seeded if range condition is poor. Siberian and crested wheatgrass, Russian wildrye and Whitmar bluebunch wheatgrass are some adapted plants suitable for reseeding. There is a moderate to high chance that seeding will fail because of droughtiness. Fall seeding achieves the best results. Brush management is desirable if the amount of brush is excessive. Capability subclass VIe nonirrigated and life irrigated.

62-Taunton-Somsen complex. The soils in this unit are on rolling hills. Elevation ranges from 4,100 to 4,300 feet. Taunton fine sandy loam that has slopes of 1 to 12 percent makes up 50 percent of this unit and is in areas where the basalt is deeper. Somsen fine sandy loam that has slopes of 1 to 12 percent makes up 35 percent and is on ridges of moderately deep bedrock. Average annual precipitation is about 10 inches, average annual air temperature is about 49 degrees F, and the frost-free season is 120 to 140 days.

The rest of the unit is a soil similar to the Taunton or Somsen soil except it is loamy sand over bedrock or hardpan. This soil makes up about 10 percent of the unit. Rock outcrop and Buko loam that has 2 to 4 percent slopes
each make up 5 percent. Taunton and Somsen loamy sand are on the leeward side of hills and ridges, and Buko loam is in drainageways.

The Taunton soil is moderately deep and somewhat excessively drained and formed in alluvium derived from mixed sources. In a typical profile the surface layer is light brownish gray fine sandy loam 3 inches thick. This is underlain by very pale brown and pale brown sandy loam and loam to a depth of 27 inches. The next layer is a silica-cemented hardpan. The soil is moderately alkaline and is calcareous.

Permeability is moderately rapid. Effective rooting depth is 20 to 40 inches. Available water capacity is 2.5 to 5 inches. In irrigated areas, surface runoff is medium and the hazard of erosion is high. Under natural conditions, surface runoff is medium and the hazard of erosion is moderate. The hazard of soil blowing is moderate except for the included loamy sand in the Jackson area where it is very high.

The Somsen soil is moderately deep and well drained and formed in eolian material over basalt. In a typical profile the surface layer is grayish brown fine sandy loam 3 inches thick. The subsoil is pale brown fine sandy loam 8 inches thick. The next layer is very pale brown and pale brown gravelly fine sandy loam and gravelly loam. Basalt is at a depth of 27 inches. This soil is moderately alkaline and is calcareous below a depth of 3 inches. A layer of strong lime accumulation is between a depth of 17 and 27 inches.

Permeability is moderately rapid. Effective rooting depth is 20 to 40 inches. Available water capacity is 2 to 4 inches. In irrigated areas, surface runoff is medium and the hazard of erosion is high. Under natural conditions, surface runoff is medium and the hazard of erosion is moderate. The hazard of soil blowing is moderate except for the included loamy sand in the Jackson area where it is very high.

These soils are used for irrigated crops, wildlife habitat, and range. Irrigated crops are wheat, barley, sugar beets, potatoes, alfalfa hay, and pasture. Alfalfa responds to phosphorous fertilizer and all other crops respond to both phosphorous and nitrogen fertilizers. To maintain high yields and good soil tilth, it is necessary to rotate crops. Crop rotation should provide for a balance between such soil-depleting crops as potatoes, and such soil-building crops as alfalfa. Because of the hazard of soil blowing the surface of this soil should be protected at all times. If the surface is unprotected, crop stubble or other kinds of organic matter can be used to protect the soil.

These soils are suited to sprinkler irrigation. They require frequent, light applications of water to produce the best yields of crops.

If these soils are irrigated, they are well suited to habitat for ring-necked pheasant, Hungarian partridge, mourning dove, and nongame birds. Openland habitat can be improved by leaving grassland undisturbed and by planting shrubs and trees for nesting sites and cover. Unharvested crops furnish feed. Where these soils are not irrigated, they support a limited number of predators, nongame birds, and cottontail. Many mourning doves use areas of these soils during migration.

As range condition deteriorates, Indian ricegrass, Thurber needlegrass, and bluebunch wheatgrass decrease and big sagebrush, horsebrush, and rabbitbrush increase. If the range continues to deteriorate, sand dunes start to form. Grazing management is essential if the range is grazed by livestock. Reseeding is very hazardous and not recommended except to stabilize already depleted areas. The rate of seeding failure is extremely high. Indian ricegrass and yellow wildrye are some of the adapted plants. Brush management generally is not recommended. Capability subclass VIIIe nonirrigated and IVe irrigated.

63-Trevino silt loam, 1 to 7 percent slopes. This is a shallow, well drained soil on basalt plains. Elevation ranges from 4,100 to 4,600 feet. This soil formed in loess material over basalt bedrock. Average annual precipitation is about 9 inches, average annual air temperature is

about 49 degrees F, and the frost-free season is 120 to 140 days.

Included with this soil in mapping is Somsen fine sandy loam, 3 to 7 percent slopes. This included soil makes up about 10 percent of the total unit. Also included is Rock outcrop and Portneuf silt loam, 1 to 3 percent slopes that make up about 5 percent of the unit.

In a typical profile the surface layer is light gray silt loam 2 inches thick. The subsoil is pale brown silt loam 6 inches thick. The next layer is very pale brown silt loam to a depth of 14 inches. This is underlain by basalt. The soil is mildly alkaline and moderately alkaline to a depth of 8 inches. It is strongly alkaline and is calcareous. A layer of lime accumulation is between a depth of 8 and 14 inches.

Permeability is moderate. Effective rooting depth is 10 to 20 inches. Available water capacity is 1.8 to 3.6 inches. In irrigated areas, surface runoff is medium and the hazard of erosion is high. Under natural conditions, surface runoff is medium and the hazard of erosion is moderate. The hazard of soil blowing is moderate.

This soil is used for irrigated crops, for wildlife habitat, and for range. Irrigated crops are wheat, barley, alfalfa hay, and pasture. Alfalfa responds to phosphorous fertilizers, and all other crops respond to both phosphorous and nitrogen fertilizers. To maintain high yields and good soil tilth, crop residue must be returned to the soil. If the surface is unprotected, crop stubble or other kinds of organic matter can be used to protect the soil.

This soil is suited to sprinkler irrigation. Light, frequent applications of water are required because of shallow soil depth and low available water capacity.

If this soil is irrigated, it is well suited to habitat for ring-necked pheasant, Hungarian partridge, mourning dove, and nongame birds. Openland habitat can be improved by leaving grassland undisturbed and by planting shrubs and trees for nesting sites and cover. Unharvested crops furnish feed. Where this soil is not irrigated, it supports a limited number of predators, nongame birds, and cottontail. Many mourning doves use areas of this soil during migration.

As range condition deteriorates, bluebunch wheatgrass and Thurber needlegrass decrease and low sagebrush, forbs, and weedy annuals increase. Range can be seeded if range condition is poor. Siberian and crested wheatgrass, Russian wildrye, and Whitmar blue bunch wheatgrass are some adapted plants suitable for reseeding. There is a moderate to high chance that seeding will fail because of droughtiness. Fall seeding achieves the best results. Brush management is desirable if the amount of brush is excessive. Capability subclass VIs nonirrigated and IVe irrigated.

64-Trevino-Rock outcrop complex. The soil and miscellaneous area in this unit are on basalt ridges. Elevation ranges from 4,100 to 4,600 feet. Trevino silt loam that has slopes of 2 to 20 percent males up 60 percent of this unit and is on ridgesides. Rock outcrop is on ridgetops and ridgesides and makes up 25 percent of this unit. It consists of bare basic igneous bedrock.

The rest of this unit is Somsen fine sandy loam that has 1 to 12 percent slopes, and Vining sandy loam, 1 to 3 percent slopes, on ridgesides and Portneuf silt loam, 3 to 7 percent slopes, between the ridges. The Somsen and Vining soils each make up 10 percent of the total unit, and the Portneuf soil makes up 5 percent.

The Trevino soil is shallow and well drained and formed in loess material over basalt. Average annual precipitation is about 9 inches, average annual air temperature is about 49 degrees F, and the frost-free season is 120 to 140 days.

In a typical profile the surface layer is grayish brown and brown silt loam 8 inches thick. The subsoil is pale brown silt loam 7 inches thick. The next layer is light gray silt loam to a depth of 19 inches. This is underlain by basalt. The soil is moderately alkaline and is calcareous. A layer of strong lime accumulation is between a depth of 15 and 19 inches.

Permeability is moderate. Effective rooting depth is 10 to 20 inches. Available water capacity is 1.8 to 3.6 inches. Surface runoff is medium, and the hazards of erosion and soil blowing are moderate.

The Trevino soil is used for range and for wildlife habitat. This soil has little value in producing a large number of wildlife game. Wildlife in the area is limited to small rodents and predators.

As range condition deteriorates, the bluebunch wheatgrass and Thurber needlegrass decrease and low sagebrush, forbs, and weedy annuals increase. Range can be seeded if range condition is poor. Siberian and crested wheatgrass, Russian wildrye, and Whitmar bluebunch wheatgrass are some adapted plants suitable for reseeding. There is a moderate to high chance that seeding will fail because of droughtiness. Fall seeding achieves the best results. Brush management is desirable if the amount of brush is excessive. Capability subclass VIs nonirrigated.

65-Vining sandy loam, 1 to 3 percent slopes. This is a moderately deep, well drained soil on basalt uplands. Elevation ranges from 4,100 to 4,400 feet. This soil formed in eolian material over basalt. Average annual precipitation is about 9 inches, average annual air temperature is about 49 degrees F, and the frost-free season is 120 to 140 days.

Included with this soil in mapping is Trevino silt loam, 1 to 7 percent slopes, and Rock outcrop. These areas make up about 10 percent of the unit. Also included is a soil similar to the Vining soil except it is loamy sand throughout. This included soil has 1 to 3 percent slopes and makes up 5 percent of the unit.

In a typical profile the surface layer is pale brown sandy loam 5 inches thick. The subsoil is yellowish brown and pale brown fine sandy loam and stony fine sandy loam 19 inches thick. Basalt is at a depth of 24 inches. The soil is noncalcareous and is moderately alkaline.

Permeability is moderately rapid. Effective rooting depth is 20 to 40 inches. Available water capacity is 2.9 to 4.5 inches. Surface runoff is slow or medium, and the

hazard of erosion is slight or moderate. The hazard of soil blowing is high.

This soil is used for irrigated crops, wildlife habitat, and range. Irrigated crops are wheat, barley, sugar beets, potatoes, alfalfa hay, and pasture. Alfalfa responds to phosphorous fertilizer, and all other crops respond to phosphorous and nitrogen fertilizers. To maintain high yields and good soil tilth, crops must be rotated. Crop rotation should provide for a balance between such soil-depleting crops as potatoes, and such soil-building crops as alfalfa. Because of the hazard of soil blowing, the surface of this soil should be protected at all times. If the surface is unprotected, crop stubble or other kinds of organic matter can be used to protect the soil.

This soil is suited to sprinkler irrigation. Light, frequent applications of water are required to avoid excessive loss caused by runoff or deep percolation.

If this soil is irrigated, it is well suited to habitat for ring-necked pheasant, Hungarian partridge, mourning dove, and nongame birds. Openland habitat can be improved by leaving grassland undisturbed and by planting shrubs and trees for nesting sites and cover. Unharvested crops furnish feed. Where this soil is not irrigated, it supports a limited number of predators, nongame birds, and cottontail. Many mourning doves use areas of this soil during migration.

As range condition deteriorates, Indian ricegrass, Thurber needlegrass, and bluebunch wheatgrass decrease and big sagebrush, horsebrush, and rabbitbrush increase. If the range continues to deteriorate, sand dunes start to form. Grazing management is essential if the range is grazed by livestock. Reseeding is very hazardous and not recommended except to stabilize already depleted areas. Seeding failure is extremely high. Indian ricegrass and yellow wildrye are some of the adapted plants. Brush management generally is not recommended. Capability subclass VIIe nonirrigated and IVe irrigated.

66-Vipont very stony loam, 30 to 50 percent slopes. This is a moderately deep, well drained soil on South-facing mountainsides. Elevation ranges from 6,000 to 7,000 feet. This soil formed in material recently decomposed from mixed parent rock. Average annual precipitation is about 18 inches, average annual air temperature is about 41 degrees F, and the frost-free season is 80 to 1.00 days.

Included with this soil in mapping is a soil similar to the Vipont soil except it has a clayey subsoil. This included soil makes up about 10 percent of the !total unit. Also included are small areas of Hymas cobbly loam, Winu stony silt loam, and Alpowa cobbly loam. The included soils have 30 to 50 percent slopes.

In a typical profile the surface layer is dark grayish brown and very dark grayish brown very stony loam 8 inches thick. The subsoil is very dark grayish frown and dark grayish brown cobbly clay loam and very cobbly clay loam 14 inches thick. This is underlain by fractured bedrock. The soil is noncalcareous and is neutral and mildly alkaline.

Permeability is moderate. Effective rooting depth is 20 to 40 inches. Available water capacity is about 1 to 2.5 inches. Surface runoff is rapid, and the hazard of erosion is high. The hazard of soil blowing is slight.

This soil is used for range and for wildlife habitat. The inclusion of small pockets of aspen and brushy areas makes this soil highly desirable for mule deer. Steep slopes prevent wetland development. This area is important to some nongame birds but is undesirable for pheasants because of high elevations; long, cold winters; and lack of cropland. This habitat also supports a limited number of forest grouse. Habitat improvement would be limited to rangeland practices.

As range condition deteriorates, bluebunch wheatgrass and Idaho fescue decrease and big sagebrush increases. Range cannot be reseeded by conventional methods. Because of steep slopes, low available water capacity, and many rock fragments, these soils should be managed in a way that will benefit the desired plant species. Brush management is desirable if the amount of brush is excessive. Capability subclass VIIs nonirrigated.

68-Weeks loam, 1 to 3 percent slopes. This is a deep, well drained soil on valley terraces and alluvial fans (fig. 14). Elevation ranges from 4,300 to 5,000 feet. This soil formed in alluvium with loess influence. Average annual precipitation is about 11 inches, average annual air temperature is about 48 degrees F, and the frost-free season is 110 to 130 days.

Included with this soil in mapping is about 10 percent Bedke silt loam, 1 to 3 percent slopes; small areas of McMeen silty clay loam that has 0 to 2 percent slopes; and Disautel loam, 1 to 3 percent slopes. Also included is 10 percent Weeks soil that has a fine sandy loam surface layer and 1 to 3 percent slopes.

In a typical profile the surface layer is grayish brown loam and fine sandy loam 10 inches thick. The subsoil is brown and pale brown clay loam and loam 11 inches thick. The substratum is light gray, white, and brown loam to a depth of 60 inches. It has a weak silica cementation between a depth of 21 and 26 inches. The soil is calcareous below a depth of 21 inches and has a layer of strong lime accumulation between a depth of 21 and 36 inches. It is mildly alkaline and moderately alkaline.

Permeability is moderate. Effective rooting depth is 40 to 60 inches. Roots are restricted at a depth of 21 inches because of the cementation in the soil. Available water capacity is 5.5 to 7.5 inches. Surface runoff is medium. The hazard of erosion is slight in nonirrigated areas and moderate in irrigated areas. The hazard of soil blowing is moderate.

This soil is used for range, for wildlife habitat, and for irrigated crops. The main crops are potatoes, wheat, barley, sugar beets, alfalfa hay, and pasture. Crops respond well to fertilization. Phosphorous fertilizer is used on alfalfa, and nitrogen and phosphorous fertilizers are used on all other crops.

To maintain fertility and good soil tilth, it is necessary to limit tillage operations and return crop residue to the

soil. Crop rotation should provide for a balance between such soil-depleting crops as sugar beets and potatoes, and such soil-building crops as alfalfa.

Irrigation methods suited to this soil are furrow, corrugation, and sprinkler. Application rates must not exceed the intake rate of this soil or soil erosion will occur. Soil nutrient loss will be high if irrigation application exceeds the actual irrigation needed.

If this soil is irrigated, it is well suited to habitat for ring-necked pheasant, Hungarian partridge, mourning dove, and nongame birds. Openland habitat can be improved by leaving grassland undisturbed and by planting shrubs and trees for nesting sites and cover. Unharvested crops furnish feed. Where this soil is not irrigated, it supports a limited number of predators, nongame birds, and cottontail. Many mourning doves use areas of this soil during migration.

As range condition deteriorates, perennial:. grasses and other desirable plants decrease and sagebrush increases. Range can be seeded if range condition is poor. Siberian and crested wheatgrass, Russian wildrye, and Whitmar bluebunch wheatgrass are some adapted plants suitable for reseeding. There is a moderate to hig1. chance that seeding will fail because of droughtiness. Fall seeding achieves the best results. Brush management is desirable if the amount of brush is excessive. Capability subclass VIe nonirrigated and IIe irrigated.

69-Weeks loam, 3 to 7 percent slopes. This is a deep, well drained soil on valley terraces and alluvial fans. Elevation ranges from 4,300 to 5,000 feet. This soil formed in alluvium with loess influence. Average annual precipitation is about 11 inches, average annual air temperature is about 48 degrees F, and the frost-free season is 110 to 130 days.

Included with this soil in mapping is about 10 percent Bedke silt loam, 3 to 12 percent slopes, and small areas of Disautel loam, 3 to 7 percent slopes.

In a typical profile the surface layer is brown loam 5 inches thick. The subsoil is brown, pale brown, and very pale brown loam to a depth of 14 inches. The substratum is light gray, white, and brown light loam to a depth of 62 inches. It has weak silica cementation between a depth of 36 and 48 inches. The soil is calcareous below a depth of 19 inches and has a layer of strong lime accumulation between a depth of 36 and 41 inches. It is moderately alkaline.

Permeability is moderate. Effective rooting depth is 40 to 60 inches. Roots are restricted at a depth of 36 inches because of the cementation in the soil. Available water capacity is 5.5 to 7.5 inches. Surface runoff is medium to rapid. The hazard of erosion is moderate in nonirrigated areas and very high in irrigated areas. The hazard of soil blowing is moderate.

This soil is used mainly for range, for wildlife habitat, and for limited irrigated crops. The main crops are potatoes, wheat, barley, sugar beets, alfalfa hay, and pasture. Crops respond well to fertilizer. Nitrogen fertilizer is used on all crops except alfalfa, and phosphorous fertilizer is used on all crops. To maintain fertility and good soil tilth, it is important to limit tillage operations and to return crop residue to the soil. Crop rotation should provide for a balance between such soil-depleting crops as sugar beets and potatoes, and such soil-building crops as alfalfa.

Irrigation methods suited to this soil are furrow, corrugation, and sprinkler. Application rates must not exceed the intake rate of this soil or soil erosion will occur. Soil nutrient loss will be high if irrigation application exceeds the actual irrigation requirement.

If this soil is irrigated, it is well suited to habitat for ring-necked pheasant, Hungarian partridge, mourning dove, and nongame birds. Openland habitat can be improved by leaving grassland undisturbed and by planting shrubs and trees for nesting sites and cover. Unharvested crops furnish feed. Where this soil is not irrigated, it supports a limited number of predators, nongame birds, and cottontail. Many doves use areas of this soil during migration.

As range condition deteriorates, perennial grasses and other desirable plants decrease, and sagebrush increases. Range can be seeded if range condition is poor. Siberian and crested wheatgrass, Russian wildrye, and Whitmar bluebunch wheatgrass are some of the plants suitable for seeding. Fall seeding generally achieves the best results. Capability subclass VIe nonirrigated and IIIe irrigated.

70-Winu stony silt loam, 30 to 60 percent slopes. This is a moderately deep, well drained soil on north-facing mountainsides. Elevation ranges from 5,800 to 7,000 feet. This soil formed in material derived from sandstone and quartzite. Average annual precipitation is about 18 inches, average annual air temperature is about 40 degrees F, and the frost-free season is 75 to 90 days.

Included with this soil in mapping is a soil similar to the Winu soil except it does not have a subsoil and it is deeper than 40 inches. This included soil is in small aspen groves and makes up about 10 percent of the total unit. Also included is soils that have a clay subsoil and 10 to 30 percent slopes. This soil makes up about 5 percent of the unit. About 35 percent of this map unit is soils that are very similar to the Winu soil but do not have some characteristic necessary to qualify it as Winu soil. These soils respond to the same use as the Winu soil.

In a typical profile the surface layer is very dark grayish brown and dark grayish brown stony silt loam 13 inches thick. The subsoil is brown gravelly clay loam 10 inches thick. Below this is sandstone that is slightly weathered in the upper 4 inches. The soil is noncalcareous and is neutral or mildly alkaline.

Permeability is moderate. Effective rooting depth is 20 to 40 inches. Available water capacity is 3 to 4.5 inches. Surface runoff is very rapid, and the hazard of erosion is very high. The hazard of soil blowing is slight.

This soil is used for range and for wildlife habitat. The inclusion of small pockets of aspen and brushy areas makes this soil highly desirable for mule deer. Steep slopes prevent wetland development. This area is impor-

tant to some nongame birds but is undesirable for pheasant because of high elevations; long, cold winters; and lack of cropland. This habitat also supports a limited number of forest grouse. Habitat improvement would be limited to forest and rangeland practices.

As range condition deteriorates, bluebunch wheatgrass and Idaho fescue decrease and big sagebrush increases. Range cannot be reseeded by conventional methods. Because of steep slopes, low available water capacity, and many rock fragments, this soil should be managed in a way that will benefit the desired plant specie Brush management is desirable if the amount of brush is excessive. Capability subclass VIIe nonirrigated.

71-Wodskow sandy loam. This is a deep, somewhat poorly drained, nearly level soil on low valley terraces and in drainageways. Elevation ranges from 4,100 to 4,500 feet. This soil formed in mixed alluvium. Average annual precipitation is about 9 inches, average annual air temperature is about 49 degrees F, and the frost-free season is 120 to 140 days.

Included with this soil in mapping is Abo loam, Beetville loam, and Drax silt loam. These included soils have 0 to 2 percent slopes, and each makes up 10 percent of the total unit.

In a typical profile the surface layer is light brownish gray sandy loam 5 inches thick. This is underlain by light gray and light brownish gray loam to a depth of 57 inches. A layer of strong lime accumulation is between a depth of 15 and 34 inches. Light brownish grey loamy very fine sand is below a depth of 57 inches. The soil is mildly alkaline to moderately alkaline. A water table is at a depth of 30 to 48 inches from June to September. The soil is subject to rare flooding.

Permeability is moderately rapid. Effective rooting depth is 40 to 60 inches. Available water capacity is 6 to 9 inches. Surface runoff is slow, and the hazard of erosion is slight. The hazard of soil blowing is moderate.

This soil is used for irrigated crops such as wheat, barley, peas, corn silage, alfalfa hay, and pasture. Crops respond well to fertilization. Nitrogen fertilizer is used on all crops except alfalfa, and phosphorous fertilizer is used on all crops. To maintain fertility and good soil tilth, it is important to limit tillage operations and to return crop residue to the soil. Crop rotation should provide for a balance between such soil-depleting crops as sugar beets and potatoes, and such soil-building crops as alfalfa.

Irrigation methods suited to this soil are furrow, border, corrugation, and sprinkler. Soil nutrient loss will be high if irrigation application exceeds the actual irrigation requirement. Occasionally, surface salts appear where subsurface water rapidly moves to the surface and evaporates. These soluble salts need to be leached from the soil by improving drainage and by adding a surplus amount of salt-free irrigation water. If a soil is continually overirrigated without improved drainage, a shallow water table will develop.

If this soil is irrigated, it is well suited to habitat for ring-necked pheasant, Hungarian partridge, mourning dove, and nongame birds. Openland habitat can be improved or maintained for these animals by leaving grassland undisturbed for nesting sites, by leaving unharvested grain crops for food, and by planting trees and shrubs where winter cover is needed. Where this soil is adjacent to bodies of water, it is important to waterfowl as a feeding area and where desired, shallow water areas can be constructed to provide nesting sites and loafing habitat.

This soil is used for homesites in rural areas. Homes, roads, or other construction should include protection from the hazard of rare flooding, and they should be designed to allow for the low strength. Houses with basements should not be excavated below 24 inches, otherwise, artificial drainage should be provided. Septic tanks need to be designed to avoid contamination of ground water. Sewage should be carried away by a community system. Capability subclass IIw irrigated.

72-Wodskow sandy loam, drained. This is a deep, somewhat poorly drained, nearly level soil that is presently moderately well drained because of the diverting of the water source that caused the water table. It is located on low valley terraces and in drainageways. Elevation ranges from 4,100 to 4,600 feet. This soil formed in mixed alluvium. Average annual precipitation is about 9 inches, average annual air temperature is about 49 degrees F, and frost-free season is 120 to 140 days.

Included with this soil in mapping is Declo sandy loam. This included soil makes up 10 percent of the total unit. Also included are small areas of Abo loam, Beetville loam, and Drax silt loam. The included soils have 0 to 2 percent slopes.

In a typical profile the surface layer is light brownish gray sandy loam 5 inches thick. The subsoil is light brownish gray and light gray fine sandy loam and silt loam 10 inches thick. The substratum is light gray and light brownish gray sandy loam to a depth of 57 inches. A layer of strong lime accumulation is between a depth of 15 and 34 inches. Light brownish *gray* loamy very fine sand is below a depth of 57 inches. The soil is mildly alkaline and moderately alkaline.

A water table is below a depth of 60 inches. It may rise in some areas to within 30 inches during years when excessive irrigation water is used.

Permeability is moderately rapid. Effective rooting depth is 40 to 60 inches. Available water capacity is 6 to 9 inches. Surface runoff is slow, and the hazard of erosion is slight. The hazard of soil blowing is moderate.

This soil is used for irrigated crops such as wheat, barley, potatoes, corn silage, alfalfa hay, and pasture. Crops respond well to fertilization. Nitrogen fertilizer is used on all crops except alfalfa, and phosphorous fertilizer is used on all crops. To maintain fertility and good soil tilth it is important to limit tillage operations and to return crop residue to the soil. Crop rotation should provide for a balance between such soil-depleting crops as sugar beets and potatoes, and such soil-building crops as alfalfa.

Irrigation methods suited to this soil are border, furrow, corrugation, and sprinkler. Soil nutrient loss will be

high if irrigation application exceeds the actual irrigation requirement. If a soil is continually overirrigated without improved drainage, a shallow water table will develop.

If this soil is irrigated, it is suited to habitat for ring-necked pheasant, Hungarian partridge, mourning dove, and nongame birds. Openland habitat can be improved or maintained for these animals by leaving grassland undisturbed, by providing grain crops for f god, and by planting trees and shrubs where winter cover is needed. Where this soil is adjacent to bodies of water, it can be important to waterfowl as a feeding area and where desired, shallow water areas can be constructed to provide nesting sites and loafing habitat.

This soil is used for homesites in rural areas. Homes, roads, or other construction should include protection from the hazard of rare flooding, and they should be designed to allow for the low strength. Septic tanks need to be designed to avoid contamination of ground water. Sewage should be carried away by a community system. Capability subclass IIc irrigated.

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 a; 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.

Crops and pasture

GEORGE JAMES, agronomist, Soil Conservation Service, assisted in preparing this section.

The major management concerns in the use of the soils for crops and pasture are described in this section. In addition, the crops or 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 crops and 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.

Nearly all crops in the survey area require irrigation. The cool temperatures and short growing season prevent the growing of some crops, for example, corn for grain, and limit other crops, for example, dry beans, to areas of lower elevations. Those areas along the east side of the survey area that do have enough moisture for nonirrigated farming are farmed and left idle in alternate years to provide an adequate moisture supply for crop production. Nonirrigated crops are winter wheat and barley.

The windy spring weather causes hazards of dust and soil blowing. This is especially serious where fine seedbed preparation is used for alfalfa, sugar beets, and pasture. Such loamy sand soils as Quincy, and such sandy loam soils as Declo sandy loam, Taunton fine sandy loam, and Escalante sandy loam, are most affected by the wind.

Soil erosion is not a major problem on the irrigated cropland. Most of the land under irrigation has slopes of less than 2 percent. In areas where slopes are more than 2 percent, erosion is a hazard (fig. 15). This more sloping land is mostly nonirrigated at this time; however, there is a trend to establish irrigation systems on some of this

nonirrigated land. Erosion will continue to be a hazard in areas that have slopes of more than 2 percent.

Loss of the surface layer through erosion is damaging for two reasons. First, productivity is reduced and the surface layer is lost and part of the subsoil or underlying layer is incorporated into the plow layer. Loss of the surface layer is especially damaging on soils that have a high calcium concentration in the underlying layer, for example, the Declo, Portneuf, Neeley, and Weeks soils. Some soils such as Trevino, Taunton, and Somsen soils, have a restricted root zone because of the shallow depth to the duripans or bedrock. Erosion also reduces productivity on such soils as Aysees gravelly loam, Paniogue loam, and Buko loam that tend to be droughty. Second, soil erosion on farmland results in nutrients and sediment entering streams and watercourses. Control of erosion minimizes pollution of streams and watercourses by sediment and nutrients and improves quality of water for municipal use, for recreation, for fish, and for wildlife habitat.

Erosion control practices provide a protective surface cover, reduce runoff, and increase infiltration. A cropping system that keeps vegetative cover on the soil for extended periods can keep soil erosion losses to a minimum so that the productive capacity of the soils is not reduced. Legume and grass forage crops in the cropping system reduce erosion on sloping land, provide nitrogen, and improve tilth for the following crop.

Sloping soils such as the Bedke, Neeley, Kitcera, and Alpowa soils may require contour tillage and terraces to control erosion losses. On these soils, cropping systems that provide substantial vegetative cover are also needed. Minimizing tillage and leaving crop residue on the surface help to increase infiltration and reduce the hazards of runoff and erosion. These practices can be adapted to most soils in the survey area, but are more difficult to use successfully on the Kucera soils which are moderately steep to very steep.

Overirrigation on soils that have a high water table reduces production. Soils that may be adversely affected by overirrigation include Abo; Wodskow; Drax, wet; Goose Creek, wet; Paniogue, wet; and Buko, wet soils.

Soil blowing is a hazard on Declo sandy loam, Escalante sandy loam, Taunton fine sandy loam, Trevino silt loam, Somsen fine sandy loam, Vining sandy loam, and Quincy loamy sand. These soils may be damaged in a few hours if winds are strong and the unprotected soils are dry. Maintaining vegetative cover, surface mulch, or a rough surface through proper tillage minimizes soil blowing. Windbreaks of adapted shrubs and trees or vegetative barriers are effective in reducing soil blowing on loamy sand, sandy loam, and fine sandy loam.

Information on the design of erosion control practices for each kind of soil is contained in the technical guide, available in local offices of the Soil Conservation Service.

Soil drainage is needed on soils such as Abo; Wodskow; Drax, wet; Goose Creek, wet; Paniogue, wet; and Buko, wet soils. The wetness hazard exists mainly because of overirrigation of adjacent land. Careful application of irrigation water is needed. These soils need soil drainage systems to maintain the water table at an acceptable level. Subsurface drainage systems are very difficult to install and maintain along the Snake River and near the old Goose Creek channel because there are no outlets.

Soil fertility is fair in most soils of the survey area. Soils on flood plains and valley terraces range from moderately alkaline to neutral. Upland soils, such as Portneuf and Declo soils, are lower in organic matter and fertility.

On all soils, additions of nitrogen, phosphorous, and micro nutrients should be based on the results of soil tests, on the need of the crop, and on the expected level of yields. The Cooperative Extension Service can help in determining the kinds and amounts of fertilizer to apply.

Soil tilth is an important factor in seedbed preparation, seed germination, and the infiltration of water into the soil. Soils that have good tilth are granular and porous.

Some soils, such as Garbutt silt loam, Portneuf silt loam, and Paulville clay loam, are low in organic matter. The structure of these soils generally is weak and intense rainfall causes the formation of a crust on the surface. The crust is hard when the soil is dry, and it is nearly impervious to water. Once the crust forms it reduces infiltration and increases runoff. Regular additions of crop residue, manure, and other organic material can help improve soil structure and reduce crust formation.

High residue-producing cropping systems and fall plowing help all irrigated soils to maintain organic matter content and tilth. High residue-producing cropping systems and minimal tillage are needed on the nonirrigated cropland to maintain tilth and to control erosion. Loamy sand and sandy loam have weak structure and are low in organic matter. Tilth is generally good. High residue-producing cropping systems that leave the residue on the surface help control soil blowing.

Saline-alkali soils, including the Abo Variant, Brain, and Aysees soils have special management needs. They range in pH from 7.9 to 9.5. Addition of sulfur or gypsum, or both, is needed, followed by leaching irrigations to reduce the salt content and soil pH. A complete soil test can be made to determine the amount of sulfur and gypsum to add.

Field crops suited to the soils, climate, and irrigation of the survey area that are now commonly grown are potatoes, sugar beets, corn silage, dry beans, sweet corn, and peas. Wheat, barley, and oats are the common closegrowing crops on irrigated and nonirrigated soils. Potatoes are not commonly grown on wet soils such as Goose Creek, wet; Drax, wet; Buko, wet; Abo; and Wodskow soils. Corn silage, beans, sweet corn, and peas are not commonly grown on saline-alkali soils such as Abo Variant, Brain, and Aysees soils. Beans are not commonly grown in areas where the elevation is more than 4,500 feet.

Forage crops suited to the soils, climate, and irrigation of the survey area are alfalfa, alfalfa-grass, and improved pasture. Grasses and legumes, which require low moisture, are suited to nonirrigated land.

Latest information and suggestions for growing crops in the survey area can be obtained from local offices of the Cooperative Extension Service and the Soil Conservation Service.

Yields per acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 5. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors. 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 5.

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 and erosion control; the proper planting and seeding rages; 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; 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.

Capability classes and subclasses

Capability classes and subclasses show, in a general way, the suitability of soils for most kinds of field crops (7). 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 c range 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, 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.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants, or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants, or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and 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.

The capability subclass is identified in the description of each soil mapping unit in the section "Soil maps for detailed planning."

Rangeland

BY ROBERT J. BAUM, district conservationist, Soil Conservation Service

About 46 percent of the survey area is range, and 70 percent of this is public land. Although the survey area does not contain a large percentage of range, it provides the home base for many livestock operations. Cow-calf-yearling operations are dominant. Public range is used in the summer to fall season. Very few of the operators

keep their livestock on the home ranch throughout the year. Livestock graze crop residue, weather permitting, and are fed alfalfa-grass hay during the winter to spring season.

The native vegetation in many parts of the survey area has been greatly depleted by continual excessive grazing. Much of the acreage is now covered by sagebrush and cheatgrass. The amount of usable forage now produced may be less than half of that which was originally produced. Some areas where precipitation is more favorable have been reseeded to Siberian-crested wheatgrass. Productivity of the range can be increased through the use of management practices which are determined by the specific kind of soil.

Where climate and topography are similar, differences in the kind and amount of vegetation that rangeland can produce are related closely to the kind of soil (fig. 16). Effective management is based on the relationships among soils, vegetation, and water.

Table 6 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 predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. The following are explanations of column headings in table 6.

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. 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.

The rangeland is located mainly in the mountainous areas on the east, west, and south sides of the survey area. There is some rangeland to the north on the basalt plains of the Snake River. Soils of the mountains are moderately deep and shallow in most areas. Bunchgrass and shrubs is the dominant vegetation. Total air dry herbage per acre varies greatly and is dependent on soil depth, exposure, and soil slope. The mountain areas are generally very productive because of the higher precipitation. The transitional area between the mountains and valley is partially in rangeland. It consists of deep gravelly soils with low moisture holding capacity. These soils and the soils of the plain are less steep, but produce less forage because of lower precipitation. The soils of the plain are shallow and moderately deep to bedrock or hardpan.

The major management concern on most of the rangeland is controlled grazing so that the kinds and amounts of plants that make up the potential plant community are re-established. Brush management is also an important management alternative. The potential is good for increasing the productivity of rangeland in the area using sound range management based on the soil survey information and range sites and condition inventories.

Proper utilization is essential when grazing livestock to maintain range condition. A planned grazing system is desirable and often essential to maintain or improve range condition, improve plant vigor and production, and benefit wildlife and watershed values.

Windbreaks and environmental plantings

Windbreaks are established to protect livestock, buildings, and yards from wind and snow. Windbreaks also help protect fruit trees and gardens, and they furnish habitat for wildlife. Several rows of low- and high-growing broad-leaved and coniferous species provide the most protection.

Field windbreaks are narrow plantings made at right angles to the prevailing wind and at specific intervals across the field, the interval depending on erodibility of the soil. They protect cropland and crops from wind, hold snow on the fields, and provide food and cover for wildlife.

Environmental plantings help to beautify and screen houses and other buildings and to abate noise. The plants, mostly evergreen shrubs and trees, are closely spaced. A healthy planting stock of suitable species planted properly on a well prepared site and maintained in good condition can insure a high degree of plant survival.

Table 7 shows the height that locally grown trees and shrubs are expected to reach on various kinds of soil in 20 years. The estimates in table 7, based on measurements and observation of established plantings that have been given adequate care, can be used as a guide in planning windbreaks and screens. In the survey area supplemental water is required to have adequate growth and tree survival. Additional information about planning windbreaks and screens and the planting and care of trees can be obtained from local offices of the Soil Conservation Service or the Cooperative Extension Service or from 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 (4).

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; table 10 shows the suitability of each kind of soil as a source of construction materials; and table 11 shows the water management for each kind of soil.

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 (9).

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 these 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 constriction. Shear strength and permeability of compacted so it material affects 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 landfalls 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 Al 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 dim 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.

Aquifer fed excavated ponds are bodies of water made by excavating a pit or dugout into a ground-water aquifer. Excluded are ponds that are fed by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Ratings in table 11 are for ponds that are properly designed, located, and constructed. Soil properties and site features that affect aquifer-fed ponds are depth to a permanent water table, permeability of the aquifer, quality of the water, and ease of excavation.

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.

Recreation

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 fire 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

CLYDE SCOTT, biologist, Soil Conservation Service, assisted in preparing 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.

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 corn, wheat, 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 fescue, lovegrass, 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 bluestem, goldenrod, beggarweed, wheatgrass, and fescue.

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, cedar, 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 -re 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, wild millet, wildrice, saltgrass, and cordgrass 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 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, and red fox.

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, white-tailed deer, desert 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) (10) 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, CLML.

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-E. 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 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 determined 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.

In some surveys, the estimates are rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterburg limits extend a marginal amount across classification boundaries (1 or 2 percent), the classification in the marginal zone is omitted.

Physical and chemical properties

Table 15 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.(5). 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 15. 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 erodilbility 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 lose per acre per year.

Wind erodibility groups are made up of soils that have similar properties 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.

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 properties

Table 16 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 so it 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 16 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 baser rents. 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 un 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.

Cemented pans are hard subsurface layers, within a depth of 5 or 6 feet, that are strongly compacted (indurated). Such pans cause difficulty in excavation. The hardness of pans is similar to that of bedrock. A rippable pan can be excavated, but a hard pan 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.

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 (6). Unless otherwise noted, colors described are for dry 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."

Abo series

The Abo series consists of deep, somewhat poorly drained soils that formed in mixed alluvium. Abo soils are on flood plains or lake terraces. Slopes range from 0 to 2 percent. The climate is semiarid. Summers are relatively dry. Average annual precipitation is about 9 inches, average annual air temperature is about 49 degrees F, and the frost-free season is about 125 to 140 days.

Abo soils are similar to Paulville soils and are near Wodskow soils. Paulville soils do not have mottles because of segregated iron or manganese above a depth of 40 inches. Wodskow soils have a sandy loam control section and do not have an argillic horizon.

Typical pedon of Abo loam, 600 feet east and 300 feet south of the NW corner sec. 25, T. 10 S., R. 22 E.:

A11-0 to 2 inches; very pale brown (10YR 7/3) loam, brown (10YR 5/3) moist; weak thin platy structure; slightly hard, friable, sticky and plastic; many very fine and fine roots; many very fine pores; moderately alkaline (pH 8.2); clear smooth boundary. (1 to 5 inches thick)

A12-2 to 6 inches; very pale brown (10YR 7/3) silty clay loam, brown (10YR 5/3) moist; moderate thin platy structure; slightly hard, friable, sticky and plastic; common fine and very fine roots; many fine pores; moderately alkaline (pH 8.2); abrupt wavy boundary. (0 to 5 inches thick)

B21t-6 to 9 inches; pale brown (10YR 6/3) silty clay loam, brown (10YR 5/3) moist; moderate fine prismatic structure parting to strong fine and very fine subangular blocky; very hard, firm, sticky and plastic; few fine and very fine roots; few fine tubular pores; many thin clay films on faces of peds, and in pores; moderately alkaline (pH 8.2); clear wavy boundary. (3 to 10 inches thick)

B22tca-9 to 14 inches; very pale brown (10YR 7/3) clay loam, brown (10YR 5/3) moist; moderate fine and very fine subangular blocky structure; very hard, firm, sticky and plastic; few very fine and fine roots; few fine tubular pores; common thin clay films on faces of peds and in pores; moderately calcareous; moderately akaline (pH 8.3); clear wavy boundary. (0 to 6 inches thick)

C1ca-14 to 20 inches; very pale brown (10YR 7/3) loam, brown (10YR 5/3) moist; few fine faint brownish yellow (10YR 6/6) mottles, yellowish brown (10YR 5/6) moist; moderate fine and very fme subangular blocky structure; hard, firm, sticky and plastic; few medium roots; few fine tubular pores; strongly calcareous; moderately alkaline (pH 8.4); clear wavy boundary. (2 to 9 inches thick)

C2ca-20 to 34 inches; pale brown (10YR 6/3) very fine sandy loam, brown (10YR 4/3) moist; few fine faint brownish yellow (10YR 6/3) mottles, yellowish brown (10YR 5/6) moist; weak coarse subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few fine and very fine roots; few medium tubular pores; slightly calcareous; moderately alkaline (pH 8.4); abrupt smooth boundary. (6 to 15 inches thick)

C3ca-34 to 47 inches; pale brown (10YR 6/3) fine sandy loam, brown (10YR 4/3) moist; few fine distinct yellowish brown (10YR 5/6) mottles, dark yellowish brown (10YR 4/4) moist; moderate thin platy structure; slightly hard, very friable, slightly sticky and slightly plastic; few roots; few medium tubular pores; slightly calcareous; moderately alkaline (pH 8.4); abrupt wavy boundary. (6 to 15 inches thick)

C4-47 to 51 inches; pale brown (10YR 6/3) very fine sandy loam, brown (10YR 4/3) moist; common fine distinct brownish yellow (10YR 6/6) mottles, dark yellowish brown (10YR 4/4) moist; weak coarse platy structure; hard, firm, slightly sticky and slightly plastic; few fme roots; few fine pores; slightly calcareous; strongly alkaline (pH 8.6); abrupt wavy boundary. (0 to 5 inches thick)

C5-51 to 60 inches; light brownish gray (10YR 6/2) loamy fine sand, dark grayish brown (10YR 4/2) moist; common line distinct brownish yellow (10YR 6/6) mottles, dark yellowish brown (10YR 4/4) moist; weak coarse platy structure; hard, firm, slghtly sticky and slightly plastic; few fine roots; few fine pores; slightly calcareous; strongly alkaline (pH 8.6).

The soils are generally dry unless they are artificially drained. They are saturated with water in a subhorizon between a depth of 30 and 40 inches for a short period in summer because of segregation of iron or manganese within a depth of 40 inches, and they have mottles. Solum thickness and depth to the Cca horizon range from 12 to 25 inches.

The A horizon has value of 5 to 7 dry and 3 to 5 moist and has chroma of 2 or 3. It is mildly alkaline or moderately alkaline. The B2t horizon is clay loam, silty clay loam, or sandy clay loam. It is 27 to 34 percent clay and has more than 15 percent particles coarser than very fine sand. It has many to few thin or very thin clay films. It is mildly alkaline or moderately alkaline. The Cca horizon contains 15 to 22 percent calcium carbonate. Sand, loamy fine sand, or gravelly sand is below a depth of 3.5 to 5 feet, but no strongly contrasting textures are above a depth of 40 inches.

Abo Variant

The Abo Variant consists of deep, poorly drained soils that formed in stream alluvium or lake sediment. Abo Variant soils are on flood plains or lake terraces. Slopes range from 0 to 2 percent. Average annual precipitation is about 9 inches, average annual air temperature is about 49 degrees F, and the frost-free season is about 120 to 140 days. The water table is at a depth of 18 to 36 inches during peak flow. It is within 48 inches most of the time.

Abo Variant soils are similar to Abo soils, and are near Wodskow soils. Abo soils do not have a natric horizon. Wodskow soils are coarse-loamy.

Typical pedon of Abo Variant loam, 475 feet south and 1,300 feet east of the NW corner of sec. 21, T. 10 S., R. 23 E.:

Ap-0 to 12 inches; grayish brown (10YR 5/2) loam, dark brown (10YR 3/3) moist; weak thin and medium platy structure; slightly hard, friable, slightly sticky and slightly plastic; common fine, very fine, and medium roots; common very fine pores; slightly calcareous; strongly alkaline (pH 8.5); clear smooth boundary. (4 to 12 inches thick)

B2t-12 to 18 inches; dark yellowish brown (10YR 4/4) silty clay loam, (10YR 3/4) moist; moderate coarse prismatic structure parting to strong fine and medium blocky; slightly hard, friable, sticky and plastic; many very fine, common medium, and few fine roots; common fine pores; thin nearly continuous clay films; slightly calcareous; strongly alkaline (pH 8.5); clear wavy boundary. (5 to 12 inches thick)

B3t-18 to 25 inches; dark yellowish brown (10YR 4/4) silty clay loam, (10YR 3/4) moist; common faint mottles; moderate medium prismatic structure parting to moderate medium and fine subangular blocky; slightly hard, friable, sticky and plastic; few fine and common very fine roots; common fine pores; clay films in pores; moderately calcareous; strongly alkaline (pH 8.5); gradual diffuse boundary. (2 to 10 inches thick)

C1ca-25 to 42 inches; pale brown (10YR 6/3) light clay loam, brown (10YR 5/3) moist; common faint mottles; massive; slightly hard, friable, sticky and plastic; common medium, fine, and very fine roots; common fine pores; strongly calcareous; strongly alkaline (pH 8.8); gradual smooth boundary. (10 to 20 inches thick)

C2ca 42 to 55 inches; pale brown (10YR 6/3) loam, brown (10YR 5/3) moist; common faint mottles; massive; slightly hard, very friable, slightly sticky and slightly plastic; few fine roots; few very fine pores; moderately calcareous; strongly alkaline (pH 8.6); clear smooth boundary. (5 to 30 inches thick)

C3ca-55 to 61 inches; light brownish gray (10YR 6/2) loamy fine sand, dark grayish brown (10YR 4/2) moist; massive; soft, very friable; few fine roots; few very fine pores; strongly alkaline (pH 8.8).

Thickness of the solum and depth to the Cca horizon are 12 to 25 inches. The soil is strongly saline throughout.

The A horizon has value of 4 to 6 dry and 3 or 4 moist and has chroma of 2 to 4. The B horizon is clay loam, silty clay loam, sandy clay loam, or heavy loam. Depth to the IIC horizon is more than 40 inches.

Alpowa series

Alpowa series consists of deep, well drained soils that formed in alluvium derived from loess and other mixed sources. Alpowa soils are on alluvial fans. Slopes range from 1 to 60 percent. Average annual precipitation is about 14 inches, average annual cur temperature is about 48 degrees F, and the frost-free season is about 100 to 130 days.

Alpowa soils are near Bedke and Weeks soils. Bedke soils have a B horizon and less than 35 percent gravel in the control section. Weeks soils are nongravelly in the control section and have a B horizon.

Typical pedon of Alpowa loam, 3 to 12 percent slopes, 1,275 feet north of the southwest corner of sec. 33, T. 11 S., R. 24 E., about 8 miles south and 7 miles east of Burley:

A11-0 to 2 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, slightly sticky and slightly plastic; many very fine interstitial pores; moderately alkaline (pH 8.1); abrupt smooth boundary. (2 to 4 inches thick)

A12-2 to 10 inches; grayish brown (10YR 5/2) loam, dark brown (10YR 3/3) moist; weak coarse subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many vary fine and common fine and medium roots; many very fine and few fine tubular pores; about 10 percent pebbles; moderately alkaline (pH 8.2); abrupt wavy boundary. (5 to 10 inches thick)

C1-10 to 27 inches; pale brown (10YR 6/3) cobbly loam, dark brown (10YR 4/3) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; common very fine and medium roots; many very fine pores; about 15 percent pebbles and 15 percent cobbles; very slightly calcareous; moderately alkaline (pH 8.3); 2lear wavy boundary. (8 to 15 inches thick)

C2ca-27 to 35 inches; pale brown (10YR 6/3) *very* cobbly loam, brown (10YR 4/3) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; common very fine and medium roots; many very fine pores; about 40 percent pebbles and 15 percent cobbles; very strongly calcareous; moderately alkaline (pH 8.4); clear wavy boundary. (8 to 10 inches thick)

C3-35 to 60 inches; pale brown (10YR 6/3) very cobbly sandy loam, brown (10YR 4/3) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; common very fine and medium roots; many very fine pores; about 25 percent pebbles and 20 percent cobbles; few lime veins; strongly calcareous; moderately alkaline (pH 8.4).

Depth to the Cca horizon is 10 to 30 inches.

The A horizon is silt loam or loam and has coarse fragments ranging from 0 to 35 percent. It has value of 4 or 5 dry and 2 or 3 moist and has chroma of 2 or 3. Lime is at a depth of 8 to 14 inches. The C horizon is silt loam or loam in the less than 2 millimeter fraction. It has value of 6 or 7 dry and 4 to 6 moist and has chroma of 3 or 4. Coarse fragments range from 35 to 65 percent. The percentage of gravel and cobbles is about equal. The Cca horizon contains 16 to 25 percent calcium carbonate equivalent.

Aysees series

The Aysees series consists of deep, somewhat excessively drained soils that formed in mixed alluvium (fig. 17). Aysees soils are on alluvial fans. Slopes range from 1 to 12 percent. Average annual precipitation is about 8 inches, average annual air temperature is about 50 degrees F, and the frost-free season is about 110 to 130 days.

Aysees soils are near Garbutt, Paniogue, and Alpowa soils. Garbutt soils have a dominantly coarse-silt loam control section. Paniogue soils have a contrasting layer between a depth of 20 and 40 inches. Alpowa soils have a mollic epipedon.

Typical pedon of Aysees gravelly loam, 1 to 12 percent slopes, about 1,300 feet south and 400 feet west of the NE corner of sec. 16, T. 13 S., R. 21 E.:

A1-0 to 3 inches; light brownish gray (10YR 6/2) gravelly loam, dark grayish brown (10YR 4/2) moist; weak thin platy structure parting to weak very fine granular; soft, friable, slightly sticky and slightly plastic; common very fine and few medium roots; many very fine and fine vesicular pores; 20 percent pebbles; slightly calcareous; moderately alkaline (pH 8.3); abrupt smooth boundary. (3 to 6 inches thick)

B2-3 to 6 inches; light gray (10YR 7/2) gravelly clay loam, dark brown (10YR 4/3) moist; moderate thin platy structure parting to moderate fine granular; slightly hard, very friable, sticky and plastic; common very fine and few fine vesicular pores; 30 percent pebbles; slightly calcareous; moderately alkaline (pH 8.2); abrupt smooth boundary. (3 to 7 inches thick)

C1ca-6 to 16 inches; very pale brown (10YR 7/3) very gravelly sandy loam, yellowish brown (10YR 5/4) moist; weak medium subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; common very fine and fine roots; common very fine interstitial pores; 60 percent pebbles; strongly calcareous; strongly alkaline (pH 8.7); abrupt wavy boundary. (3 to 11 inches thick)

C2casi-16 to 21 inches; very pale brown (10YR 7/3) very gravelly loamy coarse sand, very pale brown (10YR 7/4) moist; single grained; loose, nonsticky and nonplastic; common fine roots; discontinuous weak cementation; 80 percent pebbles; strongly calcareous; strongly alkaline (pH 8.8); abrupt wavy boundary. (5 to 11 inches thick)

C3-21 to 60 inches; very pale brown (10YR 8/3) moist very gravelly coarse sand; single grained; loose; common very fine and fine roots; 90 percent pebbles; slightly calcareous; moderately alkaline (pH 8.1).

The soil is moderately alkaline to strongly alkaline to a depth of more than 40 inches. The 10- to 40-inch control section has an average texture of very gravelly loamy sand and contains 40 to 90 percent rock fragments. Solum thickness and the depth to the Cca horizon are 6 to 13 inches.

The A1 horizon has value of 6 or 7 dry and 4 or 5 moist and has chroma of 2 or 3. It is gravelly loam, gravelly sandy loam, cobbly loam, loam, or sandy loam. It has granular or platy structure. The B2 horizon has value of 6 or 7 dry. It is gravelly loam, loam, or gravelly clay loam. The C horizon has value of 7 or 8 dry and 5 to 8 moist and has chroma of 2 to 4. The C2casi horizon ranges from weakly cemented, with only a few silica bridges, to strongly cemented, with 1/4-inch thick discontinuous layers in pockets and seams.

Bedke series

The Bedke series consists of deep, well drained soils that formed in loess and underlying alluvium and colluvium. Bedke soils are on terraces and alluvial fans. Slopes range from 1 to 12 percent. Average annual precipitation is about 13 inches, average annual air temperature is about 48 degrees F, and the frost-free season is about 100 to 120 days.

Bedke soils are near Alpowa, Neeley, and Weeks soils. Alpowa, Neeley, and Weeks soils do not have an argillic horizon.

Typical pedon of Bedke silt loam, 1 to 3 percent slopes, 1,050 feet west and 300 feet north of the SE corner of sec. 20, T. 12 S., R. 19 E., about 3 miles east and 5 miles south of Rock Creek:

A11-0 to 4 inches; pale brown (10YR 6/3) silt loam, very dark grayish brown (10YR 3/2) moist; moderate very fine granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots; neutral (pH 6.9); clear smooth boundary. (4 to 8 inches thick)

A12-4 to 8 inches; pale brown (10YR 6/3) silt loam, very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; common fine and medium roots; many very fine pores; mildly alkaline (pH 7.6); abrupt smooth boundary. (2 to 4 inches thick)

B2t-8 to 18 inches; brown (10YR 5/3) silty clay loam, dark yellowish brown (10YR 3/4) moist; strong medium prismatic structure parting to strong fine and medium subangular blocky; very hard, firm, sticky and plastic; common medium and very fine roots; common fine pores; thin continuous clay films on vertical and horizontal surfaces of peds and pores; mildly alkaline (pH 7.8); clear smooth boundary. (4 to 10 inches thick)

B3-18 to 21 inches; light yellowish brown (10YR 6/4) silt loam, dark yellowish brown (10YR 4/4) moist; moderate fine and medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine roots; root matting on

peds; common fine pores; common hard (cicada) krotovinas; slightly calcareous; strongly alkaline (pH 8.7); clear smooth boundary. (3 to 5 inches thick)

C1casi-21 to 27 inches; very pale brown (10YR 8/3) loan:, light yellowish brown (10YR 6/4) moist; massive; very hard, film, slightly sticky and slightly plastic; few fine roots; few fine pores; discontinuous silica cementation between many hard (cicada) krotovinas; strongly calcareous; strongly alkaline (pH 8.9); gradual smooth boundary. (4 to 9 inches thick)

C2casi-27 to 37 inches; very pale brown (10YR 7/3) loam, lark brown (10YR 4/3) moist; massive; hard, firm and very firm, slightly sticky; few very fine roots; common fine pores; discontinuous silica cementation between common hard (cicada) krotovinas; slightly calcareous; strongly alkaline (pH 8.9); clear smooth boundary. (7 to 18 inches thick)

C3-37 to 60 inches; light gray (10YR 7/2) loam, yellowish brown (10YR 5/4) moist; massive; slightly hard, friable, slightly sticky; few very fine roots; common fine pores; strongly alkaline (pH 8.6).

Thickness of the solum is 13 to 27 inches. Bedrock is at a depth of more than 60 inches.

The Ap or A1 horizon has value of 6 or 7 dry and 3 or 4 moist and has chroma of 2 to 4. It has weak platy or granular structure. The B2t horizon has value of 4 to 6 dry and 3 or 4 moist and has chroma of 3 or 4. It is silty clay loam or clay loam and contains 27 to 35 percent clay. Structure ranges from moderate or strong prismatic to strong or moderate fine or medium subangular blocky. The C horizon leas value of 6 to 8 dry and 4 to 6 moist and has chroma of 2 to 4. It is loam, coarse sandy loam, or sandy loam. It has common to many cicada krotovinas which are weakly cemented by silica. It has firm or very firm, moist consistence.

Beetville series

The Beetville series consists of deep, moderately well drained soils that formed in stratified alluvium (fig. 18). Beetville soils are on low terraces and bottom lands. Slopes range from 0 to 2 percent. Average annual precipitation is about 10 inches including 1 to 3 feet of snow; average annual air temperature is about 49 degrees F, and the frost-free season is about 110 to 140 days.

Beetville soils are near Goose Creek and Drax soils. Goose Creek and Drax soils have a fine-loamy control section.

Typical pedon of Beetville loam, 165 feet south of the N1/4 corner sec. 16, T. 16 S., R. 22 E.:

A1-0 to 13 inches; grayish brown (10YR 5/2) loam, very cark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable, slightly sticky and slightly plastic; common fine and very fine roots; common very fine and fine pores; moderately alkaline (pH 7.9); abrupt wavy boundary. (7 to 13 inches thick)

IIC1-13 to 33 inches; light brownish gray (10YR 6/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; massive; few fire faint reddish brown mottles below 25 inches; soft, very friable, slightly sticky and slightly plastic; few fine and very fine roots; few very fine and fine pores; moderately alkaline (pH 8.4); a erupt wavy boundary. (15 to 25 inches thick)

IIIC2-33 to 49 inches; light brownish gray (10YR 6/2) loam, dark grayish brown (10YR 4/2) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few fine and very fine roots; many very fine and fine pores; slightly calcareous; moderately alkaline (pH 8.4); abrupt smooth boundary. (10 to 20 inches thick)

IVC3ca-49 to 60 inches; light brownish gray (10YR 7/2) loamy sand, dark grayish brown (10YR 4/2) moist; massive; loose, very friable, nonsticky and nonplastic; common fine interstitial pores; slightly calcareous; moderately alkaline (pH 8.2).

Organic matter decreases irregularly with increasing depth in this soil. Faint mottles commonly occur below a depth of 20 inches and above a depth of 40 inches. Distinct and prominent brown and reddish brown mottles may occur, generally below a depth of 40 inches. Typically, the profile is slightly calcareous below a depth of 40 inches, but some pedons are noncalcareous.

The A horizon has value of 4 or 5 dry, and chroma of 1 or 2. The C horizon has hue of 10YR or 2.5Y, value of 5 or 6 dry and chroma of 2 or 3. The 10- to 40-inch control section is stratified with loam, sandy loam, and loamy sand, and contains less than 20 percent gravel.

Bram series

The Bram series consists of deep, somewhat poorly drained soils that formed in alluvium or lacustrine sediment (fig. 19). Bram soils are on low terraces or fans. Slopes range from 0 to 2 percent. Average annual precipitation is about 9 inches, average annual air temperature is about 49 degrees F, and the frost-free season is about 100 to 140 days. A layer above or near a depth of 40 inches is saturated with water for 1 to 3 months each year in most places.

Bram soils are similar to Portneuf soils, and are near Buko, Paniogue, and Garbutt soils. Portneuf soils are generally dry to a depth of 40 inches and lack saturation. They have a layer that contains 20 to 50 percent durinodes. Buko and Paniogue soils have a loamy over sandy or a sandy-skeletal control section. Garbutt soils do not have a calcic horizon.

Typical pedon of Bram silt loam, 600 feet east and 660 feet north of the SW corner of sec. 30, T. 13 S., R. 22 E.:

A1-0 to 4 inches; light brownish gray (10YR 6/2) silt loam, dark grayish brown (10YR 4/2) moist; moderately fine and medium platy structure; slightly hard, friable, sticky and plastic; many very fine roots; many very fine and fine vesicular and common very fine tubular pores; slightly calcareous; very strongly alkaline (pH 9.8); clear smooth boundary. (2 to 6 inches thick)

B2-4 to 13 inches; light gray (10YR 7/2) silt loam, brown (10YR 5/3) moist; weak medium prismatic structure parting to weak medium subangular blocky; slightly hard, very friable, slightly sticky and slightly plastic; common very fine and fine roots; common very fine tubular and interstitial pores; moderately calcareous; very strongly alkaline (pH 9.6); abrupt smooth boundary. (4 to 13 inches thick)

C1ca-13 to 19 inches; light gray (10YR 7/2) silt loam, pale brown (10YR 6/3) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; common very fine and fine roots; common very fine interstitial pores; strongly calcareous; very strongly alkaline (pH 9.8); abrupt smooth boundary. (3 to 7 inches thick)

C2ca-19 to 24 inches; very pale brown (10YR 7/3) silt loam, pale brown (10YR 6/3) moist; moderate fine platy structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots; many very fine interstitial pores; strongly calcareous; very strongly alkaline (pH 9.8); clear smooth boundary. (3 to 12 inches thick)

C3ca-24 to 30 inches; light brownish gray (10YR 6/2) silt loam, brown (10YR 5/3) moist; weak moderate subangular blocky structure; slightly hard, friable, sticky and plastic; common very fine roots; many very fine interstitial pores; strongly calcareous; many lime veins; very strongly alkaline (pH 92); clear smooth boundary. (4 to 8 inches thick)

C4-30 to 35 inches; light brownish gray (10YR 6/2) silt loam, dark grayish brown (10YR 4/2) moist; weak coarse prismatic structure; slightly hard, friable, sticky and plastic; common very fine roots; common very fine tubular pores; slightly calcareous; very strongly alkaline (pH 9.4); clear smooth boundary. (3 to 10 inches thick)

IIC5-35 to 41 inches; pale brown (10YR 6/3) silt loam, dark brown (10YR 4/3) moist; weak coarse platy structure; slightly hard, friable,

slightly sticky and plastic; common very fine root:,; many very fine tubular pores; slightly calcareous; very strongly alkaline (pH 9.4); clear smooth boundary. (5 to 7 inches thick)

IIC6-41 to 52 inches; light gray (10YR 7/2) silt loam, brown (10YR 5/3) moist; common medium distinct olive brown (2.5Y 4/4) mottles; weak very coarse platy structure; hard, friable, slightly sticky and slightly plastic; common very fine roots; many very fine tubular pores; slightly calcareous; very strongly alkaline (pH 9.4); gradual smooth boundary. (5 to 20 inches thick)

IIIC7-52 to 60 inches; gravelly loam.

At some depth above 35 inches, the conductivity of the saturation extract is 2 millimhos per centimeter or greater at 25 degrees C. The 10 to 40-inch control section is dominantly silt loam or loam and averages 12 to 18 percent clay and less than 15 percent particles coarser than very fine sand.

The Ap horizon or the upper 7 inches of the soil, when mixed, has hue of 10YR or 2.5Y, value of 5 to 7 dry and 4 or 5 moist and has chroma of 2 or 3. The organic matter content is 0.8 to 1.2 percent in the upper 15 inches of the soil and decreases regularly with increasing depth. The A and B horizons range from slightly calcareous to moderately calcareous and from very strongly alkaline to moderately alkaline. The B horizon has hue of 2.5Y or 10YR and value of 6 or 7 dry and 4)r 5 moist. Structure ranges from very weak to moderate fine to medium subangular blocky to weak medium or coarse prismatic. The B and Cca horizons generally have very few or no nodules but can range to as much as 20 percent nodules. The C horizon has hue of 5Y to 10YR, value of 6 or 7 dry and 4 to 6 moist, and has chroma of 2 to 4. The Cra (calcic) horizon
contains 15 to 25 percent carbonates, some of which am in segregation. The C horizon above a depth of 40 inches is generally mottled. At least one horizon is slightly saline to strongly saline or saline-alkali in some pedons.

Buko series

The Buko series consists of deep, well drained soils that formed in alluvium derived from mixed sources (fig. 20). Buko soils are on stream terraces. Slopes range from 0 to 4 percent. Average annual precipitation is about 10 inches, average annual air temperature is about 49 degrees F, and the frost-free season is about 110 to 140 days.

Buko soils are similar to Paniogue soils and are near Drax and Declo soils. Paniogue soils do not have a weakly cemented horizon above the sand and gravel. Drax soils have a mollic epipedon, are moderately well drained, moderately fine textured, and deeper than 40 inches to sand and gravel. Declo soils are more than 40 inches deep to sand and gravel.

Typical pedon of Buko loam in an area of PaniogueBuko complex, 100 feet north and 1,700 feet east of the SW corner of sec. 29, T. 12 S., R. 23 E., about 13 miles south of Burley and 3/4 mile east of Pole Line Road:

A1-0 to 7 inches; brown (10YR 5/3) loam, pale brown (10YR 6/3) rubbed, dark brown (10YR 3/3) moist; weak fine and medium subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots; few fine pores; moderately alkaline (pH 8.0); gradual wavy boundary. (3 to 7 inches thick)

B2-7 to 12 inches; pale brown (10YR 6/3) clay loam, brown (10YR 4/3) moist; weak fine and medium subangular blocky structure; slightly hard, friable, sticky and plastic; common very fine and fine roots; common fine pores; moderately alkaline (pH 8.1); clear *wavy* boundary. (5 to 13 inches thick)

C1ca-12 to 20 inches; very pale brown (10YR 7/3) loam, dark yellowish brown (10YR 4/4) moist; massive; slightly hard, firm, slightly sticky and slightly plastic; common very fine and fine roots; few very fine and fine pores; pockets of root mats; 50 percent hard firm cicaca nodules; moderately calcareous; moderately alkaline (pH 8.4); clear smooth boundary. (6 to 11 inches thick)

C2casi-20 to 28 inches; very pale brown (10YR 8/3) loam, yellowish brown (10YR 5/4) moist; massive; hard, very firm, slightly sticky and slightly plastic; few very fine and fine roots; few very fine pores; weakly cemented (brittle); strongly calcareous; moderately alkaline (pH 8.4); clear irregular boundary. (6 to 8 inches thick)

IIIC3ca-28 to 60 inches; very pale brown (10YR 7/3) very gravelly loamy sand, yellowish brown (10YR 5/4) moist; single grained; loose; few very fine roots; 55 percent pebbles; moderately calcareous; moderately alkaline (pH 82).

Depth to loose sand and gravel ranges from 20 to 36 inches. Depth to secondary carbonates ranges from 11 to 17 inches.

The A horizon has value of 5 or 6 dry and 3 or 4 moist and has chroma of 2 or 3. Organic matter content is about 1.5 to 3 percent in the A horizon and decreases regularly with increasing depth. The B2 horizon has chromes of 3 or 4. It is generally clay loam or silty clay loam, but includes loam or silt loam with 18 to 35 percent clay and 40 to 60 percent silt. The Cca horizon contains 20 to 50 percent nodules or durinodes or both. Part of the Cca horizon, at least 6 inches thick, is weakly cemented and contains 15 to 25 percent calcium carbonate equivalent. The underlying sand and gravel consists of stratified layers of sand and loamy sand, with gravel ranging from 20 to 70 percent but averaging 35 to 60 percent in most pedons.

Declo series

The Declo series consists of deep, well drained soils that formed in alluvium or in alluvium over lake-deposited material. Declo soils are on valley terraces. Slopes range from 0 to 7 percent. Average annual precipitation is about 9 inches, average annual air temperature is about 49 degrees F, and the frost-free season is about 110 to 140 days.

Declo soils are similar to Escalante and Somsen soils and are near Buko, Paniogue, and Trevino soils. Escalante soils are dominantly moderately coarse in the control section. Somsen soils have bedrock at a depth of 20 to 40 inches. Buko and Paniogue soils have sand and gravel above a depth of 40 inches. Trevino soils have bedrock at a depth of 10 to 20 inches.

Typical pedon of Declo loam, 1 to 3 percent slopes, 900 feet north and 300 feet east of the SW corner SW1/4NW1/4 sec. 20, T. 10 S., R. 22 E.:

Ap1-0 to 3 inches; light brownish gray (10YR 6/2) loam, dark grayish brown (10YR 4/2) moist; moderate very fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; common very fine roots; many very fine and fine tubular pores; moderately calcareous; moderately alkaline (pH 82); clear smooth boundary. (0 to 10 inches thick)

Ap2-3 to 10 inches; pale brown (10YR 6/3) loam, dark brown (10YR 4/3) moist; weak coarse platy structure; slightly hard, very friable, slightly plastic; common fine and very fine roots; few very fine pores; slightly calcareous; moderately alkaline (pH 8.3); clear smooth boundary. (3 to 10 inches thick)

C1-10 to 14 inches; light gray (10YR 7/2) silt loam, grayish brown (10YR 5/2) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; few fine roots; few fine tubular pores; slightly calcareous; moderately alkaline (pH 8.1); abrupt smooth boundary. (0 to 6 inches thick)

IIC2ca-14 to 20 inches; white (10YR 8/2) silt loam, pale brown (10YR 6/3) moist; weak fine platy structure; slightly hard, friable, slightly sticky and slightly plastic; few fine, very fine, and medium roots;

common very fine tubular pores; strongly calcareous; moderately alkaline (pH 8.4); gradual wavy boundary. (6 to 20 inches thick)

IIIC3ca-20 to 44 inches; light gray (10YR 7/2) silt loam, brown (10YR 5/3) moist; moderate very fine platy structure; slightly hard, friable, sticky and plastic; few fine and very fine roots; many fine and very fine tubular pores; strongly calcareous; moderately alkaline (pH 8.4); abrupt smooth boundary. (0 to 10 inches thick)

IIIC4-44 to 60 inches; pale brown (10YR 6/3) very fine sandy loam, dark grayish brown (10YR 4/2) moist; massive; soft, friable, slightly plastic; few fine and medium roots; few fine and very fine tubular pores; slightly calcareous; strongly alkaline (pH 8.9).

The 10- to 40-inch control section is stratified, but it is dominantly medium textured. It averages less than 18 percent clay, more than 15 percent fine and coarser sand, and less than 15 percent coarse fragments. Bedrock or strongly contrasting texture is at a depth of more than 60 inches. The solum ranges from 3 to 16 inches in thickness.

The Ap horizon or upper 7 inches of the soil, when mixed, has value of 5 to 7 dry and 3 to 5 moist, and has chroma of 2 or 3. However, value is not both 5 dry and 3 moist or both broken and crushed. When undisturbed, the Al horizon has platy structure; elsewhere, it has weak or very weak very fine granular structure. In many places, the upper 2 or 3 inches of the soil is vesicular. The A horizon is commonly slightly or moderately calcareous and has a pH of 7.4 to 8.2, but some undisturbed pedons are noncalcareous and neutral. The upper boundary of the calcic horizon (Cca) is at a depth of less than 16 inches. This horizon has hue of 10YR or 2.5Y, value of 6 to 8 dry and 4 to 6 moist, and has chroma of 2. It commonly contains 15 to 30 percent calcium carbonate, but some subhorizons contain as much as 50 percent. In places, especially where the soil is not irrigated, part of the Cca horizon is slightly saline or moderately saline or saline-alkali and contains as much as 15 to 30 percent of exchangeable sodium. Mottles above 40 inches in depth are due to lime and not to wetness. Laminated sediment is, in some pedons, below a depth of 25 to 36 inches.

Disautel series

The Disautel series consists of deep, well drained soils that formed in alluvium derived from mixed sources. Disautel soils are in broad drainage channels and on alluvial fans. Slopes range from 1 to 7 percent. Average annual precipitation is about 13 inches, average annual air temperature is about 48 degrees F, and the frost-free season is about 110 to 125 days.

Disautel soils are similar to Alpowa soils and are near Bedke, Mackey, and Weeks soils. Alpowa soils have more than 35 percent rock fragments in the control section. Bedke soils do not have a mollic epipedon. Weeks soils have a weakly cemented calcic horizon. Mackey soils have bedrock within a depth of 20 to 40 inches.

Typical pedon of Disautel loam, 1 to 3 percent slopes, 550 feet west and 1,475 feet south of the NE corner of sec. 10, T. 11 S., R. 24 E.:

A1-0 to 4 inches; brown (10YR 5/3) loam, dark brown (10YR 3/3) moist; weak medium subangular blocky and weak fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine and few fine and medium roots; many very fine pores; moderately alkaline (pH 8.0); abrupt smooth boundary. (3 to 9 inches thick)

B21-4 to 16 inches; brown (10YR 5/3) heavy silt loam, dark brown (10YR 3/3) moist; weak coarse prismatic structure parting to weak coarse subangular blocky; hard, very friable, sticky and plastic; many very fine and few fine and medium roots; many very fine pores; moderately alkaline (pH 8.0); clear smooth boundary. (5 to 12 inches thick)

B22-16 to 24 inches; pale brown (10YR 6/3) loam, dark brown (10YR 4/3) moist; weak coarse subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; common very fine and few fine and medium roots; common very fine pores; moderately alkaline (pH 8.0); abrupt wavy boundary. (8 to 12 inches thick)

C1ca-24 to 42 inches; very pale brown (10YR 7/3) loam, dark brown (10YR 4/3) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots; common very fine pores; many lime coated krotovinas; moderately calcareous; moderately alkaline (pH 8.4); clear wavy boundary. (9 to 18 inches thick)

C2- 42 to 51 inches; pale brown (10YR 6/3) very fine sandy loam, dark brown (10YR 4/3) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; few very fine roots; common very fine pores; slightly calcareous; strongly alkaline (pH 8.6); clear wavy boundary. (9 to 15 inches thick)

C3-51 to 60 inches; pale brown (10YR 6/3) sandy loam, dark brown (10YR 4/3) moist; massive; hard, firm, slightly plastic; few very fine pores; slightly calcareous; moderately alkaline (pH 8.1).

Thickness of the solum and depth to the calcareous layer are 20 to 30 inches. The 10- to 40-inch control section is loam, silt loam, or fine sandy loam and contains less than 18 percent clay. Coarse fragments in the control section consist of 0 to 20 percent by volume pebbles and cobbles. The pH of the profile ranges from 7.4 to 8.6.

The A horizon has chroma of 2 or 3. Texture is loam, silt loam, or fine sandy loam. The B horizon has value of 5 or 6 dry and 3 or 4 moist and has chroma of 2 or 3. Texture is loam, fine sandy loam, or silt loam The C horizon has value of 6 to 8 dry and 4 to 6 moist and has chroma of 2 or 3. Texture is dominantly fine sandy loam or very fine sandy loam and generally is stratified with loam or gravel in the lower part of the horizon.

Drax series

The Drax series consists of deep, moderately well drained soils that formed in alluvium. Drax soils are on low terraces. Slopes range from 0 to 2 percent. Average annual precipitation is about 9 inches, average annual air temperature is about 49 degrees F, and the frost-free season is about 110 to 140 days. The water table is at a depth of 48 inches or less. It is as shallow as 30 inches in areas that receive excess ground water from irrigation.

Drax soils are similar to Beetville and Goose Creek soils. Beetville soils have less than 18 percent clay in the control section. Goose Creek soils have a mollic epipedon that is more than 20 inches thick.

Typical pedon of Drax silt loam, 800 feet south and 1,950 feet west of the NE comer of sec. 24. T. 11 S., R. 22 E., about 5 miles south of Burley:

Ap-0 to 8 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure parting to weak fine granular; slightly hard, friable, sticky and plastic; many fine roots; common fine pores; moderately alkaline (pH 8.4); clear smooth boundary. (6 to 10 inches thick)

A12-8 to 14 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure parting to weak fine granular, slightly hard, friable, slightly sticky and slightly plastic; many fine and very fine roots; common fine pores; moderately alkaline (pH 8.4); clear smooth boundary. (4 to 8 inches thick)

C1-14 to 21 inches; light brownish gray (10YR 6/2) silt loam, dark grayish brown (10YR 4/2) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots; many very fine pores; moderately alkaline (pH 8.3); clear smooth boundary. (5 to 9 inches thick)

C2-21 to 28 inches; light brownish gray (10YR 6/2) silt loam, dark grayish brown (10YR 4/2) moist; weak medium subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; few very fine roots; common very fine pores; slightly calcareous; moderately alkaline (pH 8.4); clear smooth boundary. (5 to 9 inches thick)

IIA1b-28 to 38 inches; dark gray (10YR 4/1) silty clay loam, very dark gray (10YR 3/1) moist; few fine faint brown mottles; moderate medium and fine subangular blocky structure; slightly hard, friable, sticky and plastic; few very fine roots; common fine pores; moderately alkaline (pH 8.2); abrupt wavy boundary. (5 to 10 inches thick)

IIC3-38 to 48 inches; light brownish gray (10YR 6/2) silt loam, dark grayish brown (10YR 4/2) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; many very fine pores; slightly calcareous; moderately alkaline (pH 8.2); abrupt wavy boundary. (5 to 15 inches thick)

IIC4-48 to 55 inches; light brownish gray (10YR 6/2) silt loam, dark grayish brown (10YR 4/2) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; common very flue pores; slightly calcareous; moderately alkaline (pH 8.4); diffuse smooth boundary. (3 to 12 inches thick)

IIC5-55 to 60 inches; light brownish gray (10YR 6/2) silt loam, grayish brown (10YR 5/2) moist; few fine faint brown mottles; massive; slightly hard, friable, slightly sticky and slightly p: antic; many very fine pores; moderately alkaline (pH 8.3).

Faint mottles commonly occur below a depth of 28 inches to about 40 inches. In some pedons the entire soil contains 5 to 10 percent fine pebbles.

The A horizon has value of 2 or 3 moist and 4 o r 5 dry and has chroma of 2 or 3. Organic matter content is commonly 3 to 5 percent in the A horizon and decreases irregularly with depth. The C horizon has value of 4 or 5 moist and chroma of 2 or 3. Stratification occurs in the C horizon and a buried A horizon is common. Calcium carbonate content is variable, ranging from a trace to moderately calcareous and commonly occurring below a depth of 20 inches.

Escalante series

The Escalante series consists of deep, well drained soils that formed in alluvium and lake sediment. Escalante soils are on broad valley terraces. Slopes range from 0 to 7 percent. Average annual precipitation is about 9 inches, average annual air temperature is about 49 degrees F, and the frost-free season is about 110 to 140 days.

Escalante soils are similar to Declo and Somsen soils and are near Paniogue, Buko, Paulville, Taunton, and Wodskow soils. Declo soils have a loam or silt loam control section. Somsen and Taunton soils are 20 to 40 inches deep over bedrock and hardpan, respectively. Paulville soils have a clay loam or silt loam control section. Wodskow soils are somewhat poorly drained. Paniogue and Buko soils have gravelly sand at a depth of 20 to 40 inches.

Typical pedon of Escalante sandy loam, 0 to 1 percent slopes, 400 feet west and 150 feet north of the SE corner of the NE1/4NE1/4 sec. 5, T. 13 S., R. 22 E.:

Ap-0 to 5 inches; light brownish gray (10YR 6/2) study loam, dark grayish brown (10YR 4/2) moist; very weak thin and thick platy structure parting to weak fine subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine roots; many very fine interstitial and few fine tubular pores; slightly calcareous; moderately alkaline (pH 8.0); abrupt smooth boundary. (3 to 6 inches thick)

B2-5 to 12 inches; light brownish gray (10YR 6/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; weak coarse prismatic structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine and few fine and medium roots; many fine and few fine and medium tubular pores; slightly calcareous; moderately alkaline (pH 8.1); abrupt smooth boundary. (0 to 9 inches thick)

C1ca-12 to 15 inches; light brownish gray (10YR 6/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few very fine and fine roots; common fine and very fine tubular pores; moderately calcareous; moderately alkaline (pH 8.3); clear smooth boundary. (2 to 6 inches thick)

C2ca-15 to 24 inches; light gray (10YR 7/2) fine sandy loam, grayish brown (10YR 5/2) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few very fine and fine roots; common fine and very fine tubular pores; many firm cicada krotovinas and laminar plates; common lime veins; strongly calcareous; moderately alkaline (pH 8.3); abrupt smooth boundary. (6 to 12 inches thick)

C3ca-24 to 47 inches; light brownish gray (10YR 6/2) fine sandy loam, brown (10YR 4/3) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; few very fine and fine roots; common very fine pores; moderately calcareous; moderately alkaline (pH 8.1); abrupt smooth boundary. (12 to 29 inches thick)

IIC4-47 to 60 inches; light brownish gray (10YR 6/2) gravelly coarse sand, dark grayish brown (10YR 4/2) moist; single grained; loose dry and moist; slightly calcareous; moderately alkaline (pH 8.0).

Depth to the horizon of strong lime accumulation ranges from 10 to 16 inches, and the Cca horizon ranges from 12 to 24 inches in thickness. The weighted average organic matter content to a depth of 15 inches is more than 1 percent.

The A1 horizon has hue of 7.5YR or 10YR, value of 3 or 4 moist, and chroma of 2 or 3. It is sandy loam, fine sandy loam, and very fine sandy loam. Structure is thin to thick platy, weak fine granular, or massive. This horizon is mildly alkaline or moderately alkaline. The B2 and Cca horizons have hue of 7.5YR or 10YR, value of 6 or 7 dry and 4 to 6 moist, and have chroma of 2 or 3. They are dominantly sandy loam or fine sandy loam but may include strata of light sandy clay loam. The 10 to 40-inch control section averages 10 to 18 percent clay.

Garbutt series

The Garbutt series consists of deep, well drained soils that formed in mixed alluvium. Garbutt soils are on broad valley terraces. Slopes range from 0 to 3 percent. Average annual precipitation is about 8 inches, average annual air temperature is about 49 degrees F, and the frost-free season is about 100 to 130 days.

Garbutt soils are similar to Bram and Pocatello soils and are near Aysees soils. Bram soils have a water table and are periodically saturated above a depth of 40 inches. Pocatello soils have less than 20 percent volcanic glass in the sand and silt fraction. Aysees soils have a very gravelly sandy loam and coarse sand control section.

Typical pedon of Garbutt silt loam, 0 to 1 percent slopes, 200 feet north and 525 feet west of the SE corner of sec. 12, T. 13 S., R. 21 E.:

A1-0 to 6 inches; pale brown (10YR 6/3) silt loam, dark brown (10YR 4/3) moist; weak fine and very fine platy structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine roots; many very fine tubular pores; slightly calcareous; strongly alkaline (pH 8.5); abrupt smooth boundary. (3 to 10 inches thick)

C1ca-6 to 23 inches; very pale brown (10YR 7/3) coarse silt loam, yellowish brown (10YR 5/4) moist; weak medium and coarse subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine and fine roots; many very fine tubu-

lar pores; moderately calcareous; strongly alkaline (pH 8.6); clear smooth boundary. (11 to 20 inches thick)

C2ca-23 to 30 inches; very pale brown (10YR 7/3) silt loam, brown (10YR 5/3) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; many very fine roots; many fine and very fine tubular pores; moderately calcareous; strongly alkaline (pH 8.7); clear smooth boundary. (4 to 10 inches thick)

C3ca-30 to 45 inches; very pale brown (10YR 7/3) coarse silt loam, brown (10YR 5/3) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; many very fine roots; many very fine tubular pores; moderately calcareous; strongly alkaline (pH 8.5); clear smooth boundary. (10 to 20 inches thick)

C4-45 to 56 inches; pale brown (10YR 6/3) loam, brown (10YR 4/3) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; many very fine roots; many very fine tubular pores; slightly calcareous; moderately alkaline (pH 8.4); abrupt smooth boundary. (10 to 15 inches thick)

IIC5-56 to 72 inches; pale brown (10YR 6/3) moist; gravelly sandy loam; massive; soft, very friable, slightly sticky and slightly plastic; very fine and fine interstitial pores; moderately alkaline (pH 8.1).

The 10- to 40-inch control section is dominantly medium textured but stratified. It contains, as a weighted average, less than 18 percent clay, less than 15 percent particles coarser than very fine sand, and coarse fragments. The sand and silt fraction contains 20 to 50 percent volcanic glass in one or more layers.

The A horizon has value of 6 or 7 dry and 4 or 5 moist and has chroma of 2 or 3. It ranges from noncalcareous to moderately calcareous and has a pH of 7.6 or 8.8. The Cca horizon has hue of 10YR, value of 7or 8 dry and 4 or 5 moist, and has chroma of 2 to 4. The C horizon is moderately calcareous or strongly calcareous and has a pH that ranges from 8.0 to 9.5. Part of the C horizon is saline or saline-alkali and may contain 16 to 50 percent of exchangeable sodium.

Goose Creek series

The Goose Creek series consists of deep, moderately well drained and somewhat poorly drained soils that formed in alluvium. Goose Creek soils are on broad valley bottoms. Slopes range from 0 to 1 percent. Average annual precipitation is about 9 inches, average annual air temperature is about 49 degrees F, and the frost-free season is about 115 to 140 days. If undrained, these soils are saturated with water at a depth of 40 inches or less for 90 days or more.

Goose Creek soils are similar to Drax soils and are near Beetville soils. Drax soils have a mollic epipedon that is less than 20 inches thick. Beetville soils have a coarse loamy control section.

Typical profile of Goose Creek silty clay loam, 2,750 feet north and 1,425 feet west of the SE corner of sec. 24, T. 11 S., R. 22 E., about 5 miles south and 1 mile west of Burley:

Ap-0 to 5 inches; gray (10YR 5/1) silty clay loam, very dark gray (10YR 3/1) moist; moderate fine granular structure; slightly hard, very friable, sticky and plastic; common very fine roots; many very fine tubular pores; moderately alkaline (pH 8.0); clear smooth boundary. (4 to 7 inches thick)

A12-5 to 10 inches; grayish brown (10YR 5/2) silty clay loam, very dark gray (10YR 3/2) moist; weak coarse subangular blocky structure; hard, firm, sticky and very plastic; few very fine roots; few very fine tubular pores; moderately alkaline (pH 8.2); gradual wavy boundary. (5 to 8 inches thick)

A13b-10 to 24 inches; dark gray (10YR 4/1) silty clay loam, very dark gray (10YR 3/1) moist; weak medium subangular blocky structure parting to moderate fine granular; slightly hard, friable, sticky and plastic; common very fine and few fine and medium roots; common very fine tubular pores; few root stains in pores; moderately alkaline (pH 8.1); clear wavy boundary. (0 to 14 inches thick)

C1-24 to 34 inches; light brownish gray (10YR 6/2) loam, dark grayish brown (10YR 4/2) moist; few fine prominent reddish brown (5YR 3/3) mottles; massive; slightly hard, very friable, slightly sticky and slightly plastic; common very fine and few fine and medium roots; common fine tubular pores; few dark reddish brown (5YR 3/3) root stains around former root channels; moderately alkaline (pH 8.1); clear wavy boundary. (8 to 13 inches thick)

IIC2-34 to 39 inches; light brownish gray (10YR 6/2) silty clay loam, dark grayish brown (10YR 4/2) moist; few fine prominent reddish yellow (7.5YR 6/6) mottles; strong brown (7.5YR 5/6) moist; weak fine and moderate subangular blocky structure; slightly hard, friable, sticky and plastic; few very fine and common medium roots; common fine tubular pores; few dark reddish brown (5YR 3/3) root stains; few medium rounded firm (cicada) krotovinas; moderately alkaline (pH 8.1); clear smooth boundary. (5 to 20 inches thick)

IIIC3-39 to 60 inches; light gray (10YR 7/2) silt loam, grayish brown (10YR 5/2) moist; few fine prominent reddish brown (5YR 4/3) and reddish yellow (7.5YR 6/6) mottles; dark reddish brown (5YR 3/3) and strong brown (7.5YR 5/6) moist; massive; slightly hard, friable, sticky and plastic; few very fine pores; few root stains around former root channels; moderately alkaline (pH 8.0).

Mottles with a reddish hue or high chroma, or both, occur at any depth below 24 inches. The 10- to 40-inch control section is loam, silty clay loam, silt loam, or clay loam and averages 18 to 35 percent clay. It is normally stratified with thin strata of loamy fine sand, fine sandy loam, loam, or silt loam. Organic matter content decreases irregularly with depth. At least one buried Al horizon is in most pedons. The mollic epipedon is 20 to 28 inches thick. The soil is neutral to moderately alkaline.

The A horizon has hue of 10YR or 2.5Y, value of 4 or 5 dry and 2 or 3 moist, and has chroma of 1 to 2. The C horizon has hue of 10YR or 2.5Y and chroma of 1, 2, or 3. It is noncalcareous or slightly calcareous in some pedons below a depth of 36 inches.

Hymas series

The Hymas series consists of well drained soils that are shallow to bedrock and formed in material weathered from limestone. Hymas soils are on mountainsides. Slopes range from 25 to 60 percent. Average annual precipitation is about 14 inches, average annual air temperature is about 43 degrees F, and the frost-free season is about 60 to 100 days.

Hymas soils are similar to Mulett and Reywat soils and are near Itca, Kanlee, Mackey, and Vipont soils. Itca and Reywat sons have an argillic horizon. Mulett soils do not have a mollic epipedon. Kanlee, Mackey, and Vipont soils are 20 to 40 inches deep to bedrock.

Typical pedon of Hymas cobbly loam in an area of Hymas-Rock outcrop complex, 900 feet south and 1,300 feet east of the NW corner of sec. 23, T. 13 S., R. 23 E., about 8 miles east of Oakley:

A1-0 to 3 inches; grayish brown (10YR 5/2) cobbly loam, very dark grayish brown (10YR 3/2) moist; weak fine and very fine granular structure; soft, friable, slightly sticky and slightly plastic; abundant very fine and fine and few medium roots; many fine and very fine interstitial pores; moderately calcareous; moderately alkaline (pH 8.2); abrupt smooth boundary. (2 to 5 inches thick)

C1-3 to 8 inches; brown (10YR 5/3) cobbly heavy loam, dark brown (10YR 3/3) moist; weak medium prismatic structure parting to weak medium subangular blocky; slightly hard, friable, slightly sticky and plastic; many very fine and fine and few medium roots; common

medium tubular and interstitial pores; strongly calcareous; moderately alkaline (pH 7.9); clear irregular boundary. (2 to 6 inches thick)

C2---8 to 17 inches; brown (10YR 5/3) very cobbly loam, dark yellowish brown (10YR 3/4) moist; weak very fine subangular blocky structure; soft, very friable, slightly sticky and plastic; many very fine and fine roots; few fine tubular pores; many white flecks of partially decomposed limestone; very strongly calcareous; moderately alkaline (pH 7.9); abrupt broken boundary. (6 to 11 inches thick)

R-17 inches; dark gray (N/4) fractured limestone bedrock

Depth to limestone bedrock is dominantly 14 to 16 itches but ranges from 10 to 20 inches.

The A horizon has value of 4 or 5 dry and 2 or 3 moist. Clay content is 18 to 22 percent. The control section between 10 inches and the bedrock is dominantly medium textured with 10 to 25 percent clay and more than 35 percent coarse fragments, mostly angular fragments of limestone.

Itca series

The Itca series consists of shallow, well drained soils that formed in material recently decomposed from quartz latite mixed with loess. Itca soils are on hillsides. Slopes range from 3 to 20 percent. Average annual precipitation is about 14 inches, average annual air temperature is about 44 degrees F, and the frost-free season is about 80 to 100 days.

Itca soils are near Hymas, Kanlee, Mackey, Mulett, Reywat, Winu, and Vipont soils. Hymas and Mulett soils do not have an argillic horizon. Kanlee, Mackey, Winu, and Vipont soils are 20 to 40 percent deep to bedrock. Reywat soils have less than 35 percent clay in the argillic horizon.

Typical pedon of Itca stony sandy loam, from an area of Itca-Kanlee complex, 700 feet south and 550 feet west of the NE corner of sec. 30, T. 12 S., R. 20 E.:

A1-0 to 4 inches; grayish brown (10YR 5/2) stony coarse sandy loam, very dark brown (10YR 3/2) moist; moderate fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; many fine and very fine roots; common fine pores: 30 percent pebbles, cobbles, and stones; moderately alkaline (pH 82); abrupt smooth boundary. (4 to 8 inches thick)

B21t-4 to 11 inches; brown (10YR 5/3) very stony heavy sandy clay loam, dark brown (10YR 3/3) moist; weak and moderate fine subangular blocky structure; slightly hard, very friable, sticky and plastic; common medium and fine and few coarse roots; common fine pores; 50 percent pebbles, stones, and cobbles; few thin clay films on pod faces; moderately alkaline (pH 8.0); clear wavy boundary. (3 to 7 inches thick)

B22t-11 to 17 inches; light brown (7.5YR 6/4) very stony heavy clay loam, dark brown (7.5YR 4/4) moist; strong fine and medium subangular blocky structure; hard, friable, sticky and plastic; common fine roots; few fine interstitial pores; 50 percent cobbles and stones; many moderately thick clay films on pod faces and interstitial pores; mildly alkaline (pH 7.8); clear wavy boundary. (3 to 9 inches thick)

R-17 inches; quartz latite bedrock

Depth to bedrock is 10 to 20 inches. Rock fragments of pebbles, cobbles, flagstones, and stones are in the A and B horizon:, and range to as much as 65 percent by volume.

The A horizon has value of 4 or 5 dry and 2 or 3 moist and has chroma of 2 or 3. The B2t horizon has hue of 7.5YR or 10YR, value of 5 or 6 dry and 3 or 4 moist, and has chroma of 2 to 4. Textures include sandy clay loam, clay loam, or clay, but the average clay content is 35 to 50 percent.

Kanlee series

The Kanlee series consists of moderately deep, well drained soils that formed in alluvium. Kanlee soils are on north- or east-facing terraces. Slopes range from 3 to 20 percent. Average annual precipitation is about 17 inches, average annual air temperature is about 42 degrees F, and the frost-free season is about 70 to 90 days.

Kanlee soils are similar to Vipont and Winu soils and are near Hymas, Itca, Mackey, Mulett, and Reywat soils. Vipont soils are loamy-skeletal. Winu soils have a cryic temperature regime. Hymas, Itca, Mulett, and Reywat soils have lithic contact at a depth of less than 20 inches. Mackey soils have an ochric epipedon.

Typical pedon of Kanlee stony loam, from an area of the Itca-Kanlee complex, .3 mile west and .5 mile south of the NE corner sec. 29, T. 12 S., R. 20 E.:

A11-0 to 3 inches; grayish brown (10YR 5/2) stony loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure; soft, very friable, sticky and plastic; many fine and very fine and common medium roots; many very fine pores; neutral (pH 6.6); clear smooth boundary. (2 to 12 inches thick)

A12-3 to 10 inches; grayish brown (10YR 5/2) stony clay loam, dark brown (10YR 3/3) moist; weak fine and medium subangular blocky structure; slightly hard, friable, sticky and plastic; many fine and common very fine and medium roots; common very fine pores; neutral (pH 6.8); clear smooth boundary. (0 to 10 inches thick)

B21t-10 to 29 inches; yellowish brown (10YR 5/4) stony clay loam, dark yellowish brown (10YR 3/4) moist; moderate fine and medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common medium and few fine and very fine roots; common fine pores; common thin clay films on ped faces; neutral (pH 6.7); clear wavy boundary. (10 to 25 inches thick)

B22t-29 to 38 inches; yellowish brown (10YR 5/4) stony clay loam, dark yellowish brown (10YR 4/4) moist; moderate fine and medium subangular blocky structure; slightly hard, friable, sticky and plastic; few fine roots; common fine pores; few thin clay films on ped faces; neutral (pH 6.8); abrupt smooth boundary. (0 to 12 inches thick)

R-38 inches; bedrock.

Thickness of the solum is 20 to 40 inches. Depth to a lithic contact is also 20 to 40 inches. The profile is noncalcareous throughout and is neutral or mildly alkaline. The mollic epipedon is 10 to 20 inches thick

The A1 horizon has value of 3 to 5 dry and 1 to 3 moist and has chroma of 2 or 3. Organic matter content ranges from 4 to 9 percent and the C-N ratio is less than 14.5. The B2t horizon has hue of 7.5YR or 10YR. It has value of 4 to 6 dry and is about 1 unit lower moist. Chroma is 3 to 5. Coarse and very coarse sand and very fine quartz pebbles, mostly angular, are throughout the profile. Rock fragments make up about 15 to 35 percent by volume.

Kimama series

The Kimama series consists of deep, well drained soils that formed in alluvium. Kimama soils are on uplands. Slopes range from 0 to 2 percent. Average annual precipitation is about 10 inches, average annual air temperature is about 48 degrees F, and the frost-free season is about 110 to 130 days.

Kimama soils are similar to Disautel, McMeen, and Neeley soils and are near Alpowa, Pocatello, and Weeks soils. Disautel and Neeley soils do not have an argillic horizon. Alpowa soils have a loamy-skeletal control section. Pocatello soils have an ochric epipedon. Weeks and McMeen soils have a duripan.

Typical pedon of Kimama silt loam, 450 feet north and 1,100 feet west of the SE corner sec. 25, T. 11 S., R. 23 E.:

A11-0 to 6 inches; brown (10YR 5/3) silt loam, very dark grayish brown (10YR 3/2) moist; weak very thin platy structure parting to weak very fine granular; slightly hard, very friable, slightly sticky and slightly plastic; many very fine and few fine roots; many very fine interstitial and tubular pores; mildly alkaline (pH 7.5); abrupt smooth boundary. (3 to 10 inches thick)

A12-6 to 11 inches; pale brown (10YR 6/3) silt loam, dark brown (10YR 3/3) moist; weak fine and medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly Mastic; many very fine and fine roots; common very fine tubular pores; mildly alkaline (pH 7.6); clear smooth boundary. (2 to 8 inches thick)

B2t-11 to 19 inches; pale brown (10YR 6/3) silt loam, dark brown (10YR 3/3) moist; very weak fine prismatic structure parting to moderate fine and medium subangular blocky; hard, friable, sticky and plastic; common very fine and many fine roots; common very fine tubular pores; thin patchy clay films on vertical and horizontal ped faces; mildly alkaline (pH 7.8); clear smooth boundary. (5 to 12 inches thick)

B3-19 to 24 inches; pale brown (10YR 6/3) silt loam, dark grown (10YR 4/3) moist; moderate fine and medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; many fine and common very fine roots; common very fine tubular pores; few hard (cicada) krotovinas; moderately alkaline (pH 8.0); clear smooth boundary. (0 to 8 inches thick)

C1ca-24 to 28 inches; pale brown (10YR 6/3) silt loam, brown (10YR 4/3) moist; massive; very hard, firm, slightly sticky and slightly plastic; many fine and very fine roots; weakly cemented; strongly calcareous; moderately alkaline (pH 82); clear smooth boundary. (4to 10 inches thick)

C2-28 to 38 inches; pale brown (10YR 6/3) silt loam, brown (10YR 4/3) moist; massive; hard, friable, slightly sticky and slightly plastic; common very fine tubular pores; few (cicada) krotovinas; slightly calcareous; moderately alkaline (pH 8.4); clear wavy boundary. (0 to 20 inches thick)

IIC3ca-38 to 60 inches; very pale brown (10YR 7/3) silt loam, brown (10YR 4/3) moist; massive; hard, friable, slightly sticky and slightly plastic; common very fine tubular pores; strongly calcareous; strongly alkaline (pH 8.6).

The soil is noncalcareous to a depth between 20 and 43 inches. Thickness of the solum is 21 to 35 inches.

The A horizon, where mixed to a depth of 7 inches, has chroma of 2 or 3 and organic matter content of 12 to 2.4 percent. It ranges from slightly acid to mildly alkaline (pH 6.4 to 7.7). The B2t horizon has value of 5 or 6 dry and 3 or 4 moist and has chroma of 2 or 3. It is silt loam that contains 19 to 27 percent clay and less than 15 percent particles coarser than very fine sand. Clay films on peds range from few and very thin to patchy and thin. It is mildly alkaline or moderately alkaline (pH 7.4 to 8.4). The Cca horizon has a subhorizon with its upper boundary above a depth of 40 inches that contains 15 to 25 percent hard nodules of soil material or cicada krotovinas.

Kucera series

The Kucera series consists of deep, well drained soils that formed in loess. Kucera soils are on the north-facing sides of hills and ridges. Slopes range from 12 to 60 percent. Average annual precipitation is about 14 inches, average annual air temperature is about 43 degrees F, and the frost-free season is about 80 to 100 day3.

Kucera soils are similar to Neeley and Pocatello soils and are near Bedke soils. Neeley and Pocatello soils have an average annual soil temperature warmer than 47 degrees F. Neeley soils have a mollic epipedon that is thinner than 20 inches. Pocatello and Bedke soils do not have a mollic epipedon.

Typical pedon of Kucera silt loam, 30 to 60 percent slopes, 1,200 feet south and 2,150 feet west of the NE corner sec. 24, T. 11 S., R. 24 E.:

A11-0 to 3 inches; grayish brown (10YR 5/2) silt loam, very dark *gray*ish brown (10YR 3/2) moist; weak medium platy structure parting to weak fine granular; soft, very friable, slightly sticky and slightly plastic; many fine roots; common fine pores; mildly alkaline (pH 7.8); clear smooth boundary. (3 to 9 inches thick)

A12-3 to 34 inches; brown (10YR 5/3) coarse silt loam, dark brown (10YR 3/3) moist; weak coarse subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many fine roots; many fine pores; moderately alkaline (pH 8.0); clear smooth boundary. (17 to 34 inches thick)

B21-34 to 40 inches; pale brown (10YR 6/3) coarse silt loam, dark brown (10YR 3/3) moist; weak fine and medium subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; many fine roots; common fine pores; slightly calcareous; moderately alkaline (pH 8.2); clear smooth boundary. (6 to 15 inches thick)

B22-40 to 47 inches; very pale brown (10YR 7/3) coarse silt loam, brown (10YR 5/3) moist; weak medium prismatic structure; soft, very friable, slightly sticky and slightly plastic; many fine roots; many fine pores; moderately calcareous; moderately alkaline (pH 8.4); clear smooth boundary. (0 to 15 inches thick)

Cca-47 to 60 inches; pale brown (10YR 7/3) coarse silt loam, brown (10YR 5/3) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; common fine roots; common fine pores; moderately calcareous; strongly alkaline (pH 8.8).

The 10- to 40-inch control section is silt loam that contains less than 18 percent clay and less than 15 percent particles coarser than very fine sand. The mollic epipedon is 20 to 38 inches thick. The profile is noncalcareous between a depth of 25 to 43 inches. Depth to powdery secondary lime is less than 60 inches.

The A horizon has value of 4 or 5 dry and 2 or 3 moist and has chroma of 2 or 3. The upper few inches of the soil is platy or weak granular, and the lower part of the soil has weak granular or weak subangular blocky structure. The A horizon is neutral to moderately alkaline. The B horizon or cambic horizon has value of 5 to 7 dry and 3 to 5 moist and has chroma of 2 or 3. It is noncalcareous or slightly calcareous. The Cca horizon is moderately calcareous (5 to 14 percent lime) and mildly alkaline to strongly alkaline.

Mackey series

The Mackey series consists of moderately deep, well drained soils that formed in material decomposed from mixed igneous and metamorphic rock. Mackey soils are on escarpments and hillsides. Slopes range from 12 to 60 percent. Average annual precipitation is about 12 inches, average annual air temperature is about 49 degrees F, and the frost-free season is about 100 to 120 days.

Mackey soils are near Hymas, Itca, Kanlee, Mulett, Reywat, Winu, and Vipont soils. Hymas, Itca, Mulett, and Reywat soils have bedrock at a depth of less than 20 inches. Kanlee, Vipont, and Winu soils have a mollic epipedon.

Typical pedon of Mackey very stony sandy loam, from an area of the Mackey-Rock outcrop complex, 1,000 feet south and 100 feet west from the center of sec. 5, T. 12 S., R. 19 E.:

A1-0 to 4 inches; light brownish gray (10YR 6/2) very stony sandy loam, dark brown (10YR 3/3) moist; moderate fine granular struc-

ture; soft, very friable, slightly sticky and slightly plastic; many very fine and fine and common medium roots; 20 percent angular stones and 40 percent coarse fragments; mildly alkaline (pH 7.4); clear smooth boundary. (2 to 8 inches thick)

B2-4 to 10 inches; light yellowish brown (10YR 6/4) very stony clay loam, dark brown (10YR 3/3) moist; moderate fine and medium subangular blocky structure; slightly hard, friable, sticky and plastic; many very fine and fine and common medium roots; common very fine pores; 20 percent angular stones and 40 percent coarse fragments; mildly alkaline (pH 7.6); clear smooth boundary. (4 to 9 inches thick)

B3ca-10 to 12 inches; light yellowish brown (10YR 6/4) very stony loam, dark brown (10YR 4/3) moist; moderate fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common fine roots; few very fine pores; 15 percent angular stones and 45 percent coarse fragments; moderately calcareous; mildly alkaline (pH 7.8); clear smooth boundary. (2 to 4 inches thick)

C1ca-12 to 21 inches; pale brown (10YR 6/3) very stony sandy loam, dark brown (10YR 4/3) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; many fine and common very fine roots; 15 percent angular stones and 80 percent coarse fragments; strongly calcareous;, moderately alkaline (pH 8.4); clear wavy boundary. (8 to 20 inches thick)

C2ca-21 to 32 inches; pale brown (10YR 6/3) very stony loamy sand, dark brown (10YR 4/3) moist; massive; hard, firm; 90 percent decomposing rock fragments; common very fine and few fine roots; strongly calcareous; moderately alkaline (pH 8.4); clear smooth boundary. (8 to 11 inches thick)

R-32 inches; slightly weathered quartz latite and volcanic glass bedrock.

Thickness of the solum ranges from 10 to 20 inches. Bedrock is at a depth of 20 to 40 inches.

The A horizon has value of 6 or 7 dry and 3 to 5 moist and has chroma of 2 or 3. The B2 horizon has value of 5 to 8 dry and 3 to 6 moist and has chroma of 2 to 4. It is very stony loam, very cobbly loam, very stony clay loam, or very cobbly clay loam. Structure is fine or very fine subangular blocky and fine or very fine granular. The Cca horizon has value of 6 to 8 dry and 4 or 5 moist and has chroma of 3 or 4. It contains 35 to 90 percent rock fragments.

McMeen series

The McMeen series consists of deep, well drained soils that formed in alluvium derived from mixed sources. McMeen soils are on broad valley terraces. Slopes range from 0 to 2 percent. Average annual precipitation is about 10 inches, average annual air temperature is about 49 degrees F, and the frost-free season is about 110 to 120 days.

McMeen soils are similar to Weeks soils and are near Disautel, Buko, and Kimama soils. Disautel, Buko, and Kimama soils do not have a duripan. Weeks soils have a coarse-loamy control section.

Typical pedon of McMeen silty clay loam, 330 feet east and 80 feet south of the NW corner of SW1/4SE1/4 sec. 30, T. 11 S., R. 24 E.:

Ap-0 to 5 inches; grayish brown (10YR 5/2) silty clay loam; very dark grayish brown (10YR 3/2) moist; very weak medium subangular blocky structure parting to moderate fine granular; friable, soft, sticky and very plastic; abundant fine and very fine and plentiful medium roots; many fine and very fine and few medium tubular pores; mildly alkaline (pH 7.8); abrupt smooth boundary. (3 to 9 inches thick)

B1-5 to 10 inches; grayish brown (10YR 5/2) silty cay loam, dark brown (10YR 3/3) moist; weak and moderate median and coarse prismatic structure parting to moderate medium and coarse subangular blocky; slightly hard, firm, very sticky and very plastic; plentiful fine and very fine and few medium roots; many very fine, common fine, and few medium tubular pores; thin continuous clay films on all ped faces; moderately alkaline (pH 8.0); clear smooth boundary. (0 to 6 inches thick)

B2-10 to 22 inches; grayish brown (10YR 5/2) silty clay loam; dark brown (10YR 3/3) moist; weak and moderate coarse prismatic structure parting to moderate medium subangular blocky; hard, very firm, very sticky and very plastic; plentiful fine and very fine roots; many very fine, common fine, and few medium tubular pores; thin continuous clay films on ped surfaces; moderately alkaline (pH 8.0); gradual smooth boundary. (10 to 20 inches thick)

B3-22 to 26 inches; grayish brown (10YR 5/2) heavy silt loam; dark brown (10YR 4/3) moist; very weak medium subangular blocky structure; hard, firm, sticky and very plastic; plentiful very fine and few fine roots; many very fine and common fine tubular pores; slightly calcareous; moderately alkaline (pH 8.0); abrupt smooth boundary. (3 to 8 inches thick)

C1sim-26 to 28 inches; light brownish gray (10YR 6/2) weak to moderately cemented hardpan; grayish brown (10YR 5/2) moist; massive; moderately calcareous; brown (10YR 5/3) root mat on pan; moderately alkaline (pH 8.4); abrupt smooth boundary. (2 to 12 inches thick)

C2sim-28 to 46 inches; very pale brown (10YR 7/3) silt loam; light brownish gray (10YR 6/2) moist; weakly cemented; very hard, fu-m, sticky and plastic; thin lime veins; few very fine tubular pores; strongly calcareous; moderately alkaline (pH 8.0); gradual smooth boundary. (16 to 22 inches thick)

IIC3-46 to 60 inches; very pale brown (10YR 7/3) fine sandy loam; brown (10YR 5/3) moist; massive; very hard, firm, slightly sticky; weakly calcareous; less compacted than the C2sim horizon; moderately alkaline (pH 8.4).

Depth to the duripan is 20 to 40 inches.

The A horizon has value of 4 or 5 dry and 2 or 3 moist and has chroma of 1 or 2 moist and dry. The B2 horizon has value of 5 or 6 dry and 3 or 4 moist and has chroma of 2 or 3. It is clay loam, silt loam, or silty clay loam with more than 15 percent coarser sand than very fine sand. The lower part of the B horizon is moderately calcareous to noncalcareous and firm. The Csim horizon (duripan) ranges from weakly to strongly cemented. Thin opal or silica laminae are on more than half of the duripan.

Mulett series

The Mulett series consists of shallow, well drained soils that formed in material recently decomposed from quartz latite (fig. 21). Mulett soils are on hillsides. Slopes range from 4 to 20 percent. Average annual precipitation is about 10 inches, average annual air temperature is about 48 degrees F, and the frost-free season is about 100 to 120 days.

Mulett soils are similar to Hymas and Reywat soils and are near Itca, Kanlee, Mackey, Vipont, and Winu soils. Hymas soils have carbonatic mineralogy. Reywat, Itca, Vipont, and Winu soils have an argillic horizon. In Kanlee, Mackey, and Vipont soils bedrock is at a depth of 20 to 40 inches.

Typical pedon of Mulett very stony loam, 4 to 20 percent slopes, 700 feet west and 2,500 feet north of SE corner sec. 11, T. 14 S., R. 21 E., about 4 miles southwest of Oakley:

A1-0 to 3 inches; pale brown (10YR 6/3) very stony loam, brown (10YR 5/3) moist; moderate medium granular structure; slightly hard, friable, slightly sticky and slightly plastic; many fine and very fine roots; many very fine pores; 30 percent cobbles and stones;

moderately alkaline (pH 8.0); clear smooth boundary. (3 to 7 inches thick)

B2-3 to 11 inches; pale brown (10YR 6/3) very stony loam, dark brown (10YR 4/3) moist; moderate fine subangular blocky structure; hard, friable, sticky and plastic; few medium and many fine roots; common fine tubular pores; 35 percent cobbles and stones; moderately alkaline (pH 8.4); clear wavy boundary. (4 to 8 inches thick)

B3ca-11 to 14 inches; pale brown (10YR 6/3) very stony loam, dark brown (10YR 4/3) moist; moderate medium and fine subangular blocky structure; hard, friable, slightly sticky and slightly plastic; many fine and very fine and few medium roots; many very fine and fine tubular pores; 60 percent cobbles and stones; strongly calcareous; strongly alkaline (pH 8.6); abrupt smooth boundary. (3 to 7 inches thick)

R-14 inches; slightly weathered quartz latite bedrock; silica and lime coatings in cracks and crevices.

There is 35 to 75 percent by volume rock fragments of pebbles, cobbles, flagstones, and stones throughout the profile. The soil is mildly alkaline to strongly alkaline. Depth to bedrock ranges from 14 to 20 inches.

The A horizon has value of 5 to 7 dry and 4 or 5 moist and has chroma of 2 or 3. Texture of the fine earth is loam or silt loam. The B2 horizon has chroma of 3 or 4 and is slightly or moderately calcareous. The B3ca horizon has value of 6 to 8 dry and 4 to 6 moist and has chroma of 2 to 4. The fine earth is loam, silt loam, or clay loam.

Neeley series

The Neeley series consists of deep, well drained soils that formed in loess. Neeley soils are on hillsides. Slopes range from 4 to 12 percent. Average annual precipitation is about 13 inches, average annual air temperature is about 47 degrees F, and the frost-free season is about 100 to 120 days.

Neeley soils are similar to Kucera and Pocatello soils and are near Bedke soils. Kucera soils have an average annual soil temperature that is colder than 47 degrees F. Pocatello and Bedke soils do not have a mollic epipedon.

Typical pedon of Neeley silt loam, 4 to 12 percent slopes, 350 feet south and 1,180 feet east of the NW corner of SW1/4 sec. 24, T. 11 S., R. 24 E.:

A1-0 to 6 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak coarse and medium platy structure parting to weak medium subangular blocky; slightly hard, very friable, slightly sticky and slightly plastic; common fire roots; common fine tubular pores; mildly alkaline (pH 7.5); clear smooth boundary. (2 to 7 inches thick)

B1-6 to 15 inches; brown (10YR 5/3) silt loam, dark brown (10YR 3/3) moist; weak medium prismatic structure parting to weak medium subangular blocky; slightly hard, very friable, slightly sticky and slightly plastic; common fine roots; many fine tubular pores; mildly alkaline (pH 7.7); clear smooth boundary. (0 to 10 inches thick)

B2-15 to 30 inches; pale brown (10YR 6/3) silt loam, brown (10YR 4/3) moist; moderate medium subangular blocky structure; very hard, firm, slightly sticky and slightly plastic; common fine roots; many very fine tubular pores; moderately alkaline (pH 7.8); clear smooth boundary. (9 to 18 inches thick)

C1ca-30 to 44 inches; light gray (10YR 7/2) silt loam, grayish brown (10YR 5/2) moist; massive; hard, friable, slightly stick;' and slightly plastic; few fine roots; common very fine tubular pores; strongly calcareous; common lime veins and splotches; moderately alkaline (pH 8.2); gradual smooth boundary. (5 to 20 inches thick)

C2ca-44 to 60 inches; very pale brown (10YR 7/3) silt loam, brown (10YR 5/3) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; few fine roots; many very fine tubular pores; strongly calcareous; moderately alkaline (pH 8.2).

The 10- to 40-inch control section is silt loam that contains less than 18 percent clay and less than 15 percent coarser sand than very fine sand. Depth to the calcic horizon and thickness of the solum range from 11 to 30 inches. The mollic epipedon ranges from 7 to 15 inches in thickness.

The Ap or A1 horizon has value of 4 or 5 dry. It has about 12 to 2.5 percent organic matter content, a pH of 7 to 8.1, and is noncalcareous to slightly calcareous in some places. The cambic horizon (B2) is thin and weak. It has value of 5 or 6 dry and 3 or 4 moist and has chroma of 2 or 3. It is noncalcareous to moderately calcareous. The Cca horizon has 15 to 28 percent calcium carbonate equivalent and has a pH of 7.6 to 9.0. It contains common to many, very hard, firm, or very firm nodules of soil material or (cicada) krotovinas that slake in water and in concentrated hydrochloric acid.

Paniogue series

The Paniogue series consists of deep, well drained soils that formed in mixed stream sediment. Paniogue soils are on alluvial terraces. Slopes range from 0 to 4 percent. Average annual precipitation is about 10 inches, average annual air temperature is about 49 degrees F, and the frost-free season is about 110 to 140 days.

Paniogue soils are similar to Declo and Portneuf soils and are near Buko soils. Declo and Portneuf soils have no loose sand or gravel layer above a depth of 40 inches. Buko soils have 20 to 50 percent nodules and weak cementation in the Cca horizon.

Typical pedon of Paniogue loam in an area of Buko-Paniogue complex, 775 feet west and 175 feet south of the NE corner sec. 33, T. 12 S., R. 21 E.:

A1-0 to 9 inches; pale brown (10YR 6/3) loam, brown (10YR 4/3) moist; weak very fine granular structure; hard, very friable, slightly sticky and slightly plastic; common very fine and fine roots; common fine pores; moderately alkaline (pH 8.2); gradual smooth boundary. (4 to 10 inches thick)

B2-9 to 18 inches; pale brown (10YR 6/3) loam, brown (10YR 4/3) moist; weak medium and coarse subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; common very fine and fine roots; common very fine and fine tubular pores; moderately alkaline (pH 82); gradual smooth boundary. (5 to 15 inches thick)

C1ca-18 to 27 inches; pale brown (10YR 7/3) loam, brown (10YR 5/3) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few very fine and fine roots; few medium tubular pores; 10 percent hard rounded nodules or (cicada) krotovinas in the lower part; strongly calcareous; common soft masses and veins of lime; moderately alkaline (pH 8.3); clear wavy boundary. (6 to 18 inches thick)

C2ca-27 to 32 inches; pale brown (10YR 7/3) gravelly sandy loam, brown (10YR 4/3) moist; massive; soft, very friable; few very fine and fine roots; few fine tubular pores; 15 percent fine gravel; moderately calcareous; moderately alkaline (pH 8.4); clear wavy boundary. (0 to 10 inches thick)

IIC3-32 to 62 inches; very gravelly sand, single grained.

Thickness of the solum is 12 to 25 inches, and the depth to contrasting texture is 20 to 40 inches. The upper part of the 10- to 40-inch control section is dominantly medium textured, but loose sand or gravel, or both, or cobbles are within 40 inches of the surface.

The A horizon, or upper 7 inches of the soil, when mixed, has hue of 10YR or 2.5Y and value of 5 or 6 dry and 3 or 4 moist, but not both 5 dry and 3 moist. It contains 0.8 to 1.5 percent organic matter. It has weak or moderate platy or weak very fine granular structure. It is neutral to moderately alkaline. The B2 horizon has value of 6 or 7 dry and 4 or 5 moist and has chroma of 2 or 3 dry or moist. It is silt loam, very fine sandy loam, or loam It is noncalcareous to moderately calcare-

ous and mildly alkaline to strongly alkaline. Part of the C horizon contains 15 to 30 percent lime. The upper part of the calcic horizon is medium textured, and in most pedons, it contains few or common, hard or very hard nodules. In some pedons, part or all of the C horizon contains 15 to 65 percent exchangeable sodium.

Paulville series

The Paulville series consists of deep, well drained soils that formed in alluvium and lacustrine sediment. Paulville soils are on old lake terraces and flood plains. Slopes range from 0 to 2 percent. Average annual precipitation is about 9 inches, average annual air temperature is about 49 degrees F, and the frost-free season is about 125 to 140 days.

Paulville soils are similar to Bedke soils and are near Declo and Escalante soils. Bedke soils have at least 20 percent durinodes or a brittle soil matrix below the argillic horizon. Declo and Escalante soils do not rave an argillic horizon.

Typical pedon of Paulville clay loam, 1,000 feet east and 75 feet north of the SW corner of sec. 32, T 10 S., R. 23 E.:

A1-0 to 5 inches; pale brown (10YR 6/3) clay loam, brown (10YR 4/3) moist; weak fine granular structure; soft, friable, slightly sticky and slightly plastic; many very fine and fine roots; mildly alkaline (pH 7.6); abrupt smooth boundary. (5 to 12 inches thick)

B2t-5 to 10 inches; pale brown (10YR 6/3) clay loam, brown (10YR 4/3) moist; moderate coarse prismatic structure parting to moderate medium subangular blocky; slightly hard, friable, sticky and plastic; many fine roots; many very fine tubular pores; thin continuous clay films on vertical and horizontal ped faces; moderately alkaline (pH 8.2); abrupt smooth boundary. (4 to 10 inches thick)

B3t-10 to 15 inches; pale brown (10YR 6/3) clay loans, brown (10YR 4/3) moist; moderate medium subangular blocky structure; hard, firm, sticky and plastic; many very fine roots; many very fine tubular pores; thin patchy clay films on vertical and horizontal ped faces; moderately alkaline (pH 8.2); abrupt smooth boundary. (0 to 10 inches thick)

C1ca-15 to 29 inches; very pale brown (10YR 7/3) silt loam, brown (10YR 5/3) moist; moderate medium platy structure; hard, firm, slightly sticky and slightly plastic; many very fine roots; many very fine tubular pores; strongly calcareous; moderately alkaline (pH 8.4); clear smooth boundary. (6 to 15 inches thick)

C2ca-29 to 37 inches; very pale brown (10YR 8/3) silt loam, very pale brown (10YR 7/3) moist; moderate fine platy structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine tubular pores; moderately calcareous; moderately alkaline (pH 8.2); clear wavy boundary. (0 to 10 inches thick)

C3ca-37 to 60 inches; very pale brown (10YR 8/3) silt loam; brown (10YR 5/3) moist; massive; slightly hard, firm, slightly sticky and slightly plastic; many very fine tubular pores; slightly calcareous; moderately alkaline (pH 8.0).

Thickness of the solum and depth to the Cca horizon ranges from 15 to 30 inches. The organic matter content of the upper 15 inches of the soil is about 1 to 1.5 percent. The solum is neutral or mildly alkaline in most pedons but may be moderately alkaline in some areas because of land leveling.

The upper 7 inches of the soil, or the Ap horizon, when mixed, has value of 5 or 6 dry and 3 or 4 moist, but not both darker than 5.5 dry and 3.5 moist, broken and crushed, and has chroma of 2 or 3. The weakly expressed Bt horizon has hue of 10YR or 7.5YR and value of 5 or 6 dry and 3 or 4 moist. It is heavy loam, light clay loam, or light silty clay loam. It contains 24 to 31 percent clay and more than 15 percent sand and gravel coarser than very fine sand. Structure is weak medium prismatic parting to moderate or weak, medium to very fine subangular blocky. Common thin clay films are on peds. In some pedons, much of the Bt horizon has been mixed with the Ap horizon as a result of plowing and land leveling. Part of the Cca horizon (more than 6 inches thick) has 15 to 27 percent calcium carbonate.

Pocatello series

The Pocatello series consists of deep, well drained soils that formed in loess or alluvium derived from loess (fig. 22). Pocatello soils are on uplands. Slopes range from 0 to 30 percent. Average annual precipitation is about 9 inches, average annual air temperature is about 49 degrees F, and the frost-free season is about 110 to 140 days.

Pocatello soils are similar to Garbutt, Kucera, Neeley, and Portneuf soils and are near Red soils. Garbutt soils have 20 to 50 percent volcanic glass in the sand and silt fraction and are moist for continuous periods of less than 45 days in spring. Kucera and Neeley soils have a mollic epipedon. Portneuf and Rad soils have a calcic horizon with more than 15 percent durinodes.

Typical pedon of Pocatello silt loam, 0 to 1 percent slopes, 2,450 feet west and 3,500 feet north of the SE corner of sec. 27, T. 10 S., R. 22 E.:

A11-0 to 6 inches; pale brown (10YR 6/3) silt loam, high in coarse silt, dark grayish brown (10YR 4/2) moist; weak medium platy structure; slightly hard, very friable, slightly sticky and slightly plastic; many fine roots; common very fine and fine pores; slightly calcareous; moderately alkaline (pH 8.1); clear smooth boundary. (4 to 9 inches thick)

A12-6 to 12 inches; pale brown (10YR 6/3) silt loam, brown (10YR 4/3) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; many fine tubular pores; slightly calcareous; moderately alkaline (pH 8.0); clear smooth boundary. (4 to 12 inches thick)

C1ca-12 to 30 inches; pale brown (10YR 6/3) silt loam, high in 'coarse silt, brown (10YR 5/3) moist; weak coarse subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many fine roots; many fine and very fine tubular pores; few krotovinas; moderately calcareous; moderately alkaline (pH 7.9); clear wavy boundary. (18 to 32 inches thick)

C2-30 to 60 inches; very pale brown (10YR 7/3) silt loam, high in coarse silt, brown (10YR 5/3) moist; massive; soft, friable, slightly sticky and slightly plastic; moderately calcareous; moderately alkaline (pH 8.4).

The 10- to 40-inch control section is silt loam or silt that contains much coarse silt, less than 18 percent (mostly 6 to 12 percent) clay, and less than 5 percent particles coarser than very fine sand. Depth to the Cca horizon is 8 to 20 inches.

The Ap horizon or the upper 7 inches of the soil, when mixed, has value of 6 or 7 dry and 4 or 5 moist. In most pedons, the A1 or Ap horizon is slightly or moderately calcareous, but in some undisturbed pedons the upper few inches of the soil is noncalcareous. The upper part of the C horizon has chroma of 2 or 3. It approaches 15 percent calcium carbonate but does not qualify for a calcic horizon above 40 inches. The Cca horizon has few or common segregations of carbonates and 5 to 15 percent hard or very hard, rounded nodules of soil material or (cicada) krotovinas. The soil is mildly alkaline or moderately alkaline above the Cca horizon and is moderately alkaline to strongly alkaline below that.

Portneuf series

The Portneuf series consists of deep, well drained soils that formed in loess and silty lacustrine sediment (fig. 23).

Portneuf soils are on lake terraces and uplands. Slopes range from 0 to 20 percent. Average annual precipitation is about 9 inches, average annual air temperature is about 49 degrees F, and the frost-free season is about 110 to 140 days.

Portneuf soils are similar to Bram, Declo, Escalante, Kimama, Neeley, Pocatello, Rad, Somsen, and Taunton soils and are near Trevino soils. Bram soils are generally moist in part of the 20- to 40-inch zone because of a water table. They also have a layer above or at a depth of about 40 inches that is saturated with water for a month or longer. Declo, Escalante, Somsen, and Taunton soils have more than 15 percent particles coarser than very fine sand in the control section. Kimama and Neeley soils have a mollic epipedon. Pocatello soils do not have a calcic horizon. Rad soils are noncalcareous to a depth of more than 7 inches. Somsen soils have basalt bedrock within a depth of 40 inches. Taunton soils have a duripan.

Typical pedon of Portneuf silt loam, 3 to 7 percent slopes, 250 feet east and 50 feet south of the N W corner of the NE1/4 of sec. 13, T. 12 S., R. 23 E.:

Ap-0 to 10 inches; light brownish gray (10YR 6/2) silt loam, dark grayish brown (10YR 4/2) moist; very weak very fine granular structure; soft, very friable, slightly sticky and slightly plastic; common very fine and fine roots; common very fine tubular pores; slightly calcareous; moderately alkaline (pH 8.4); abrupt smooth boundary. (2 to 12 inches thick)

B2ca-10 to 14 inches; very pale brown (10YR 7/3) silt loam, pale brown (10YR 6/3) moist; very weak medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine and few fine roots; common very fine tubular pores; common (cicada) krotovinas in the lower part; strongly calcareous; moderately alkaline (pH 8.4); clear smooth boundary. (0 to 10 inches thick)

C1ca-14 to 24 inches; very pale brown (10YR 8/3) silt loan, pale brown (10YR 6/3) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; few very fine and fine roots; many very fine tubular pores; common hard (cicada) krotovinas and nodules; strongly calcareous; strongly alkaline (pH 8.6); clear smooth boundary. (6 to 16 inches thick)

C2ca-24 to 32 inches; light gray (10YR 7/2) silt loam, pale brown (10YR 6/3) moist; massive; soft, very friable, slightly sticky and slightly plastic; many very fine roots; many very fine tubular pores; few hard krotovinas; strongly calcareous; strongly alkaline (pH 8.8); clear irregular boundary. (5 to 16 inches thick)

C3-32 to 60 inches; light gray (10YR 7/2) silt loam, brown (10YR 5/3) moist; massive; very hard, firm, slightly sticky and slightly plastic; few very fine roots; many very fine tubular pores; moderately calcareous; strongly alkaline (pH 9.0).

The 10- to 40-inch control section is silt loam that contains less than 18 percent (mainly 6 to 13 percent) clay and less than 15 percent particles coarser than very fine sand. Depth to the calcic horizon is 6 to 15 inches.

The A horizon has value of 5 or 6 dry and 3 or 4 moist and has chroma of 2 or 3. The Ap horizon, or the upper 7 inches of :he soil, when mixed, has value of not less than 5.5 dry and 3.5 moist, broken and crushed. The B horizon, where present, has value of 6 or 7 dry and 4 to 6 moist and has chroma of 2 or 3. The organic matter content of the upper 15 inches of the soil averages 1 to about 2.5 percent.

The Cca horizon has value of 6 to 8 dry and 4 to 6 moist and has chroma of 2 or 3. It is slightly hard or hard and is friable or firm. It contains 15 to 30 percent very hard or hard, firm or very firm, dense, rounded or cylindrical, blocky nodules of soil material or (cicada) krotovinas. In places these nodules and krotovinas have a very thin lime coating but are less calcareous in their interior. The most calcareous subhorizon of the Cca horizon contains about 22 to 28 percent calcium carbonate equivalent. Depth to the lower boundary of the compact, strong accumulation of calcium carbonate ranges from 24 to 45 inches.

Quincy series

The Quincy series consists of deep, somewhat excessively drained soils that formed in eolian sand. Quincy soils are on valley terraces. Slopes range from 3 to 12 percent. Average annual precipitation is about 9 inches, average annual air temperature is about 49 degrees F, and the frost-free season is about 110 to 140 days.

Quincy soils are near Scoon, Somsen, Taunton, Trevino, and Vining soils. Scoon and Taunton soils have a duripan at a depth of less than 40 inches. Somsen, Trevino, and Vining soils have bedrock at a depth of less than 40 inches.

Typical pedon of Quincy loamy sand, 3 to 12 percent slopes, 50 feet north and 20 feet west of the SE corner of the SE1/4NE1/4 sec. 20, T. 10 S., R. 22 E.:

A1-0 to 7 inches; pale brown (10YR 6/3) loamy sand, dark grayish brown (10YR 4/2) moist; single grained; soft, very friable; many very fine roots; many fine interstitial pores; slightly calcareous; moderately alkaline (pH 82); abrupt smooth boundary. (0 to 9 inches thick)

C1-7 to 21 inches; very pale brown (10YR 7/3) loamy fine sand, dark grayish brown (10YR 4/2) moist; massive; soft, very friable; few medium and fine and common very fine roots; common very fine in terstitial pores; slightly calcareous; moderately alkaline (pH 8.0); gradual wavy boundary. (10 to 30 inches thick)

C2-21 to 41 inches; very pale brown (10YR 7/3) loamy sand, brown (10YR 4/3) moist; massive; slightly hard, very friable, few very fine and very few medium roots; few very fine tubular pores; slightly calcareous; moderately alkaline (pH 8.1); clear smooth boundary. (10 to 30 inches thick)

C3ca-41 to 60 inches; light gray (10YR 7/2) fine sandy loam, brown (10YR 4/3) moist; massive; slightly hard, friable; few medium and very fine roots; few very fine tubular pores; moderately calcareous; moderately alkaline (pH 8.4).

The A horizon has value of 4 to 7 dry and 3 to 5 moist and has chroma of 2 or 3. Organic matter content of the A horizon to a depth of 7 inches, when mixed, is commonly very low and is less than 1 percent. Colors of the C horizon are similar to those of the A horizon except value is 1 unit less.

Rad series

The Rad series consists of deep, well drained soils that formed in alluvium derived from loess. Rad soils are on terraces. Slopes range from 1 to 3 percent. Average annual precipitation is about 9 inches, average annual air temperature is about 49 degrees F, and the frost-free season is about 110 to 130 days.

Rad soils are similar to Portneuf soils and are near Pocatello soils.. Pocatello and Portneuf soils are calcareous.

Typical pedon of Rad silt loam, 1 to 3 percent slopes, 75 feet east and 75 feet south of NW corner of sec. 14, T. 12 S., R. 22 E., 10 miles northeast of Oakley on west side of Idaho Highway 27:

A11-0 to 4 inches; light brownish gray (10YR 6/2) silt loam, dark grayish brown (10YR 4/2) moist; weak fine and very fine granular struc-

ture; soft, very friable, slightly plastic; many very fine and few fine roots; common very fine pores; moderately alkaline (pH 8.0); abrupt smooth boundary. (1 to 4 inches thick)

A12-4 to 7 inches; grayish brown (10YR 5/2) very fen sandy loam, dark grayish brown (10YR 4/2) moist; weak very cause platy structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine roots; many very fine pores; moderately alkaline (pH 82); abrupt smooth boundary. (3 to 7 inches thick)

B2-7 to 15 inches; light brownish gray (10YR 6/2) loam, dark grayish brown (10YR 4/2) moist; moderate coarse prismatic structure; very hard, firm, slightly sticky and slightly plastic; many very fine roots; common very fine and few fine pores; moderately alkaline (pH 7.9); abrupt smooth boundary. (4 to 10 inches thick)

B3-15 to 23 inches; light gray (10YR 7/2) silt loam, brown (10YR 5/3) moist; moderate coarse subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots; common very fine and few fine pores; common hard (cicada) krotovinas; moderately alkaline (pH 8.0); clear smooth boundary. (0 to 8 inches thick)

C1sica-23 to 35 inches; light gray (10YR 7/2) silt loan, brown (10YR 5/3) moist; weak coarse subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots; many very fine pores; discontinuous silica cementation between many hard (cicada) krotovinas; strongly calcareous: moderately alkaline (pH 8.4); clear smooth boundary. (10 to 18 inches thick)

C2sica-35 to 42 inches; light gray (10YR 7/2) silt loan, brown (10YR 5/3) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots; many very fine pores; discontinuous silica cementation between common hard (cicada) krotovinas; lime veins on krotovinas; slightly calcareous; moderately alkaline (pH 8.4); abrupt smooth boundary. (7 to 32 inches thick)

C3ca--42 to 62 inches; pale brown (10YR 6/3) silt loom, dark brown (10YR 4/3) moist; weak medium subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; few very fine roots; many very fine pores; strongly calcareous; strongly alkaline (pH 8.6); clear smooth boundary. (14 to 20 inches thick)

C4ca-62 to 65 inches; pale brown (10YR 6/3) gravelly loam, dark brown (10YR 4/3) moist; weak coarse prismatic structure; slightly hard, friable, sticky and slightly plastic; common very fine roots; many very fine pores; strongly calcareous; strongly alkaline (pH 8.8).

Thickness of the solum ranges from 12 to 23 inches and bedrock is deeper than 40 inches. Depth to the Csica horizon is 20 to 40 inches.

The A horizon has value of 5 or 6 dry and 3 or 4 moist and has chroma of 2 to 4. After the first 7 inches are mixed, it has value of more than 5.5 dry. The B2 horizon has value of 5 or 6 dry and 3 or 4 moist and has chroma of 2 to 4. It is loam, silt loam, or clay loam. Structure is prismatic to subangular blocky. The C horizon has value of 6 to 8 dry and 4 to 6 moist and has chroma of 2 to 4. It is slightly calcareous to strongly calcareous and is moderately alkaline to strongly alkaline. It has common to many (cicada) krotovinas which are weakly cemented by silica

Reywat series

The Reywat series consists of shallow, well drained soils that formed in material recently decomposed from quartz latite. Reywat soils are on mountain ridges and terraces. Slopes range from 0 to 30 percent. Average annual precipitation is about 13 inches, average annual air temperature is about 46 degrees F, and the frost-free season is about 90 to 110 days.

Reywat soils are similar to Hymas, Itca, and Mulett soils and are near Kanlee, Mackey, Vipont, and Winu soils. Hymas soils are carbonatic and frigid. Itca soils are clayey-skeletal. Mulett soils have an ochric epipedon. Kanlee, Mackey, Vipont, and Winu soils are deeper than 20 inches to bedrock.

Typical pedon of Reywat cobbly loam, 0 to 30 percent slopes, 2,600 feet west and 100 feet north of the SE corner sec. 15, T. 12 S., R. 19 E.:

A1-0 to 3 inches; brown (10YR 5/3) cobbly loam, dark brown (10YR 3/3) moist; moderate fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; many fine and very fine roots; 20 percent cobbles; mildly alkaline (pH 7.4); clear smooth boundary. (2 to 8 inches thick)

B1-3 to 8 inches; brown (10YR 5/3) gravelly clay loam, dark brown (10YR 3/3) moist; moderate fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many fine roots; common fine pores; 30 percent cobbles, pebbles, and stones; mildly alkaline (pH 7.6); clear wavy boundary. (2 to 6 inches thick)

B2t-8 to 16 inches; pale brown (10YR 6/3) very cobbly clay loam, dark brown (10YR 4/3) moist; moderate fine subangular blocky structure; hard, friable, sticky and plastic; many fine roots; common medium and fine pores; 55 percent pebbles, cobbles, and stones; common thin clay films on peds; mildly alkaline (pH 7.6); abrupt wavy boundary. (6 to 10 inches thick)

R-16 inches; quartz latite bedrock

Thickness of the solum and depth to bedrock range from 10 to 20 inches. The mollic epipedon is 7 to 11 inches thick. The soil is mildly alkaline to moderately alkaline.

The A horizon has chroma of 2 or 3. It is cobbly loam or cobbly silt loam. The B2t horizon has value of 5 or 6 dry and 3 or 4 moist and has chroma of 2 or 3.

Scoon series

The Scoon series consists of shallow, well drained soils that formed in a loess or lacustrine mantle over basalt rock. Scoon soils are on sides and tops of hills. Slopes range from 0 to 30 percent. Average annual precipitation is about 9 inches, average annual air temperature is about 49 degrees F, and the frost-free season is about 110 to 135 days.

Scoon soils are similar to Taunton soils and are near Quincy, Somsen, Trevino, and Vining soils. Taunton soils have a duripan at a depth of 20 to 40 inches. Quincy soils have a sandy control section. Somsen, Trevino, and Vining soils do not have a duripan.

Typical pedon of Scoon silt loam, from an area of Scoon-Taunton complex, 2,425 feet north and 350 feet west of the SE corner sec. 24, T. 13 S., R. 22 E.:

Ap-0 to 5 inches; light brownish gray (10YR 6/2) silt loam, dark grayish brown (10YR 4/2) moist; weak fine and medium platy structure; slightly hard, friable, slightly sticky and slightly plastic; common fine and very fine roots; many fine and very fine pores; moderately alkaline (pH 8.4); gradual smooth boundary. (4 to 7 inches thick)

C1ca-5 to 12 inches; very pale brown (10YR 7/3) gravelly loam, brown (10YR 5/3) moist; weak fine platy structure; slightly hard, very friable, slightly sticky and slightly plastic; common fine and very fine and many medium and coarse roots; few fine tubular pores; moderately calcareous; moderately alkaline (pH 8.4); 35 percent gravel; abrupt wavy boundary. (5 to 13 inches thick)

IIC2casim-12 inches; indurated lime-silica cemented duripan.

Depth to the duripan ranges from 10 to 20 inches. The soil has value of 6 or 7 dry and 4 or 5 moist and has chroma of 2 or 3. It is silt loam, loam, or very fine sandy loam in the fine earth fraction. Content of coarse fragments range from 0 to 10 percent in the A horizon and from 10 to 60 percent in the C1ca horizon, but the weighted average is less than 35 percent in the control section. The coarse fragments consist of basalt or fragments of duripan. The duripan is 6 inches to several feet thick and overlies basalt bedrock.

Somsen series

The Somsen series consists of moderately deep, well drained soils that formed in eolian and lacustrine deposits over basalt bedrock. Somsen soils are on basalt plains. Slopes range from 3 to 20 percent. Average annual precipitation is about 9 inches, average annual air temperature is about 49 degrees F, and the frost-free season is about 120 to 140 days.

Somsen soils are similar to Declo, Escalante, and Vining soils and are near Quincy, Scoon, Taunton, and Trevino soils. Declo, Escalante, and Quincy soils do not have bedrock above a depth of 40 inches. Declo soils are dominantly medium textured in the control section. Vining soils do not have a calcic horizon. Quincy soils have a sandy control section. Scoon and Taunton soils have a duripan above the bedrock. Trevino soils have lithic contact at a depth of less than 20 inches.

Typical pedon of Somsen fine sandy loam, 3 to 7 percent slopes, 1,300 feet north and 3,800 feet east of the SW corner of sec. 15, T. 9 S., R. 25 E.:

A1-0 to 3 inches; grayish brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine and fine roots; few fine tubular pores; moderately alkaline (pH 8.0); abrupt smooth boundary. (3 to 8 inches thick)

B2-3 to 11 inches; pale brown (10YR 6/3) fine sandy loam, dark brown (10YR 3/3) moist; weak fine and medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine and fine roots; common fine tubular pores; slightly calcareous; moderately alkaline (pH 8.1); clear smooth boundary. (3 to 8 inches thick)

C1ca-11 to 17 inches; pale brown (10YR 6/3) gravelly own, brown (10YR 4/3) moist; weak medium subangular block, structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine and few fine roots; common fine tubular pores; moderately calcareous; moderately alkaline (pH 8.2); clear wavy boundary. (0 to 10 inches thick)

C2ca-17 to 27 inches; very pale brown (10YR 8/3) gravelly fine sandy loam; brown (10YR 5/3) moist; massive; stony; slightly :lard, friable, slightly sticky and slightly plastic; common very fine and few fine roots; common very fine tubular pores; strongly calcareous; moderately alkaline (pH 8.4); abrupt irregular boundary. (10 to 21 inches thick)

R-27 inches; basalt with lime coating on surface.

The 10-inch to bedrock control section is predominantly moderately coarse textured and averages less than 18 percent clay and less than 35 percent by volume rock fragments. Basalt is at a depth of 20 to 40 inches. Thickness of the solum ranges from 6 to 16 inches and depth to the calcic horizon is 7 to 16 inches.

The Ap horizon, or the upper 7 inches of the soil, when mixed, has value of 5 or 6 dry and 3 to 5 moist and has chroma of 2 or 3. The thin All horizon may be noncalcareous; but where the soil is mixed to a depth of 7 inches, it is slightly or moderately calcareous. The B or cambic horizon is weakly expressed, has chroma of 2 or 3, and very weak or weak subangular blocky structure. It is slightly or moderately calcareous. The Cca horizon has value of 6 to 8 dry and 4 to 7 moist and has chroma of 2 or 3. It is fine sandy loam, sandy loam, gravelly loam, gravelly fine sandy loam, or light loam.

Taunton series

The Taunton series consists of moderately deep, well drained soils that formed in alluvium and lacustrine sediment. Taunton soils are on valley terraces. Slopes range from 1 to 12 percent. Average annual precipitation is about 10 inches, average annual air temperature is about 49 degrees F, and the frost-free season is about 110 to 140 days.

Taunton soils are similar to Scoon soils and are near Quincy, Somsen, Trevino, and Vining soils. Scoon soils are less than 20 inches deep to a duripan. Quincy soils have a sandy control section. Somsen, Trevino, and Vining soils do not have a duripan.

Typical pedon of Taunton fine sandy loam, in an area of Taunton-Somsen complex, 3,700 feet west and 50 feet south of the NE corner of sec. 14, T. 9 S., R. 25 E.:

A1-0 to 3 inches; light brownish gray (10YR 6/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; weak fine granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine roots; many very fine tubular pores; mildly alkaline (pH 7.8); clear smooth boundary. (3 to 8 inches thick)

B2-3 to 15 inches; pale brown (10YR 6/3) sandy loam, brown (10YR 4/3) moist; weak medium prismatic structure parting to weak medium subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; common fine and very fine roots; common very fine tubular pores; mildly alkaline (pH 8.0); clear smooth boundary. (4 to 14 inches thick)

B3-15 to 20 inches; pale brown (10YR 6/3) sandy loam, brown (10YR 4/3) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots; common very fine tubular pores; slightly calcareous; moderately alkaline (pH 8.0); clear wavy boundary. (0 to 9 inches thick)

C1ca-20 to 27 inches; very pale brown (10YR 8/3) light loam, pale brown (10YR 6/3) moist; weak medium subangular blocky structure; slightly hard, firm, slightly sticky and slightly plastic; common very fine roots; many very fine pores; very weakly cemented; root matting on structural plates; strongly calcareous; moderately alkaline (pH 8.4); abrupt smooth boundary. (6 to 20 inches thick)

C2casim-27 inches; very pale brown (10YR 8/3). Indurated silica hardpan

Thickness of the solum ranges from 10 to 20 inches. Depth to the duripan is 20 to 40 inches.

The Ap or A1 horizon has value of 5 or 6 dry and 3 or 4 moist and has chroma of 2 or 3. It is fine sandy loam or loam. The B horizon has value of 6 or 7 dry and 4 or 5 moist and has chroma of 2 or 3. It is sandy loam, light loam, or fine sandy loam. The C horizon has value of 6 to 8 dry and 5 or 6 moist and has chroma of 2 or 3. It contains 5 to 35 percent pebble-sized indurated duripan fragments.

Trevino series

The Trevino series consists of shallow, well drained soils that formed in loess over basalt bedrock. Trevino soils are on basalt plains and hills. Slopes range from 1 to 20 percent. Average annual precipitation is about 9 inches, average annual air temperature is about 49 degrees F, and the frost-free season is about 110 to 140 days.

Trevino soils are similar to Hymas and Mulett soils and are near Quincy, Scoon, Somsen, Taunton, and Vining soils. Hymas and Mulett soils have more than 35 percent coarse fragments in the control section. Quincy soils have a sandy control section. Scoon soils have a duripan at a depth of less than 20 inches. Somsen, Taunton, and Vining soils are deeper than 20 inches to bedrock.

Typical pedon of Trevino silt loam in an area of Portneuf-Trevino complex, 95 feet west and 125 feet north of the SE corner of the NE 1/4 sec. 15, T. 11 S., R. 21 E.:

A1-0 to 2 inches; light gray (10YR 7/2) silt loam, brown (10YR 4/3) moist; weak and moderate very fine platy structure; slightly hard, very friable, slightly sticky and slightly plastic; common very fine and fine roots; many medium and fine vesicular cores; mildly alkaline (pH 7.7); abrupt smooth boundary. (1 to 5 inches thick)

B1-2 to 4 inches; pale brown (10YR 6/3) silt loam, dark brown (10YR 3/3) moist; weak fine platy structure parting to weak fine granular; slightly hard, friable, slightly sticky and slightly plastic; common fine and few medium roots; many fine interstitial pores; mildly alkaline (pH 7.8); abrupt smooth boundary. (0 to 4 inches thick)

B2-4 to 8 inches; pale brown (10YR 6/3) silt loam, dark brown (10YR 4/3) moist; weak coarse platy structure parting to weak medium subangular blocky; slightly hard, very friable, sticky and plastic; common fine and few medium roots; common fine tubular pores; few very thin clay films on pores and some vertical and horizontal ped faces; moderately alkaline (pH 8.0); abrupt smooth Boundary. (3 to 8 inches thick)

C1ca-8 to 14 inches; very pale brown (10YR 7/3) silt loam, brown (10YR 5/3) moist; strong fine and medium subangular blocky structure; hard, increasing to very hard below 11 inches, friable, slightly sticky and slightly plastic; few fine roots; common fine tubular pores; moderately calcareous; strongly alkaline (pH 8.6); abrupt wavy boundary. (4 to 12 inches thick)

R-14 inches; lime coated basalt bedrock.

Thickness of the solum ranges from 6 to 15 inches. Depth to bedrock ranges from 8 to 20 inches. The soil is loam or silt loam with more than 15 percent fine sand and coarser sand.

The A and B horizons have value of 5 to 7 dry and 3 or 4 moist and have chroma of 2 or 3. The Cca horizon has value of 6 or 7 dry and 4 or 5 moist and has chroma of 2 or 3. Depth to lime ranges from 8 to 13 inches, but may be at the surface in disturbed places. A weak to moderate calcium carbonate accumulation is just above or on the bedrock Weak cementation or hard nodules are in the Cca horizon in some areas.

Vining series

The Vining series consists of moderately deep, well drained soils that formed in eolian material. Vining soils are on basalt plains. Slopes range from 1 to 3 percent. Average annual precipitation is about 9 inches, average annual air temperature is about 49 degrees F, and the frost-free season is about 120 to 140 days.

Vining soils are similar to Somsen soils and are near Quincy, Scoon, Taunton, and Trevino soils. Somsen soils have a calcic horizon above the bedrock. Quincy soils have a sandy control section. Scoon and Taunton soils are shallow and moderately deep over a duripan. Trevino soils are shallow to a lithic contact.

Typical pedon of Vining sandy loam, 1 to 3 percent slopes, 1,350 feet north and 4,550 feet east of the SW corner of sec. 2, T. 9 S., R. 25 E.:

A11-0 to 2 inches; pale brown (10YR 6/3) sandy loam, dark grayish brown (10YR 4/2) moist; moderate fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; many fine and very fine roots; many fine pores; moderately alkaline (pH 8.0); abrupt smooth boundary. (2 to 6 inches thick)

A12-2 to 5 inches; pale brown (10YR 6/3) sandy loan, dark grayish brown (10YR 4/2) moist; weak fine subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; common fine and very fine roots; few fine pores; moderately alkaline (pH 8.1); clear smooth boundary. (0 to 4 inches thick)

B2-5 to 16 inches; yellowish brown (10YR 5/4) fine sandy loam, dark brown (10YR 3/3) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common fine and few very fine roots; common fine pores; moderately alkaline (pH 8.3); clear wavy boundary. (7 to 12 inches thick)

B3-16 to 24 inches; pale brown (10YR 6/3) stony fine sandy loam, dark brown (10YR 3/3) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine and fine roots' many very fine, fine, and medium pores; 15 percent stones and 10 percent pebbles; moderately alkaline (pH 8.4); abrupt irregular boundary. (6 to 24 inches thick)

R-24 inches; basalt with some lime veins in fractures.

The 10-inch to bedrock control section is sandy loam, fine sandy loam, and loam that contains less than 18 percent clay in the fine earth fraction. It contains 0 to 30 percent rock fragments. Depth to bedrock ranges from 20 to 40 inches. Thickness of the solum ranges from 11 to 30 inches. The upper 15 inches of the soil averages about 0.7 to 125 percent organic matter.

The Ap horizon, or upper 7 inches of the soil, when mixed, has value of 5 or 6 dry and 3 or 4 moist and has chroma of 2 or 3. It is not darker than value of 5.5 dry and 3.5 moist, crushed or broken. In some pedons, there is a C horizon. The Cca horizon is below 18 to 30 inches in some pedons and is a thin layer just above the bedrock.

Vipont series

The Vipont series consists of moderately deep, well drained soils that formed in residuum and colluvium derived from quartzite, sandstone, and other rocks. Vipont soils are on the south-facing mountain slopes. Slopes range from about 30 to 50 percent. Average annual precipitation is about 18 inches, average annual air temperature is about 41 degrees F, and the frost-free season is about 80 to 100 days.

Vipont soils are similar to Kanlee and Winu soils and are near Hymas, Itca, Mulett, and Reywat soils. Kanlee and Winu soils have less than 35 percent rock fragments in the profile. Hymas, Itca, Mulett, and Reywat soils have lithic contact at a depth of less than 20 inches. Mackey soils do not have an argillic horizon or a mollic epipedon.

Typical pedon of Vipont very stony loam, 30 to 50 percent slopes, near the northwest corner of NE1/4SE1/4 of sec. 35, T. 13 S., R. 23 E.:

A1-0 to 4 inches; dark grayish brown (10YR 4/2) very stony loam, very dark brown (10YR 2/2) moist; moderate very fine granular structure; friable, slightly sticky and slightly plastic; few fine, medium, and coarse roots; many fine interstitial pores; neutral (pH 6.6); abrupt smooth boundary. (3 to 7 inches thick)

A3-4 to 8 inches; very dark grayish brown (10YR 3/2) very stony heavy loam, very dark grayish brown (10YR 3/2) moist; moderate fine subangular blocky structure; friable, slightly sticky and slightly plastic; few fine, medium, and coarse roots; common medium and many fine tubular pores; neutral (pH 7.0); clear smooth boundary. (3 to 6 inches thick)

B1t-8 to 13 inches; very dark grayish brown (10YR 3/2) cobbly clay loam, very dark grayish brown (10YR 3/2) moist; moderate fine angular blocky structure; very hard, firm, slightly sticky and plastic; common fine and medium roots; common medium and many fine tubular pores; many moderately thick clay films; mildly alkaline (pH 7.4); clear wavy boundary. (4 to 9 inches thick)

B2t-13 to 22 inches; dark grayish brown (10YR 4/2) very cobbly heavy clay loam, dark brown (10YR 3/3) moist; moderate medium angular blocky structure; extremely hard, firm, sticky and plastic; few fine and medium roots; few fine tubular pores; many moderately thick and thin clay films; mildly alkaline (pH 7.4); gradual wavy boundary. (9 to 18 inches thick)

R-22 inches; bedrock; slightly fractured and weathered in the upper 2 to 5 inches.

Depth to bedrock and thickness of the solum range from 20 to 40 inches. Rock fragments include stones, cobbles, flagstones, :and pebbles that range in volume from 20 to 50 percent in the A horizon and B1 horizons and increase to 35 to 70 percent in the B2t and lower horizons. In most pedons, the soil is noncalcareous throughout, but where the underlying bedrock is calcareous sandstone, a very cobbly 133 horizon is weakly calcareous.

The A horizon has value of 3 or 4 dry and 2 or 3 mc1st and has chroma of 1 or 2. The B2t horizon has hue of 10YR or 7.5YR, value of 4 or 5 dry and 2 or 3 moist, and has chroma of 2 or 3. Texture of the fine earth fraction is clay loam or sandy clay loam and contains 28 to 35 percent clay. Clay films range from common thin to continuous moderately thick Structure of the B2t horizon ranges from weak subangular blocky to strong angular blocky.

Weeks series

The Weeks series consists of deep, well drained soils that formed in alluvium. Weeks soils are on alluvial fans and terraces. Elevation ranges from 4,300 to 11,000 feet. Slopes range from 1 to 7 percent. Average annual precipitation is about 11 inches, average annual air temperature is about 48 degrees F, and the frost-free season is about 110 to 130 days.

Weeks soils are similar to McMeen soils and are near Alpowa, Disautel, and Kimama soils. McMeen soils have more than 18 percent clay in the control section. Alpowa soils have more than 35 percent rock fragments in the control section. Alpowa, Disautel, and Kimama soils do not have a duripan.

Typical pedon of Weeks loam, 1 to 3 percent slopes, 300 feet east and 50 feet north of the SW corner of sec. 15, T. 11 S., R. 24 E., about 5 miles south and 7 1/2 miles east of Burley:

Ap-0 to 7 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; moderate very fine granular structure; soft, very friable, slightly plastic; common fine and few medium roots; many fine interstitial pores; neutral (pH 7.0); clear smooth boundary. (5 to 10 inches thick)

A12-7 to 10 inches; grayish brown (10YR 5/2) fine sand" loam, dark grayish brown (10YR 4/2) moist; weak very fine granular structure; soft, friable, slightly plastic; common fine and few medium roots; many fine and very fine and few medium tubular pores; neutral (pH 7.2); clear smooth boundary. (2 to 6 inches thick)

B2-10 to 14 inches; brown (10YR 5/3) light clay loam, dark brown (10YR 4/3) moist; weak medium prismatic structure parting to moderate medium and fine subangular blocky; hard, friable, sticky and plastic; common fine roots; many fine and medium tubular pores; slight glazing on vertical and horizontal faces; mildly alkaline (pH 7.6); gradual smooth boundary. (3 to 5 inches thick)

B3-14 to 21 inches; pale brown (10YR 6/3) loam, dark brown (10YR 4/3) moist; moderate medium and fine angular blocky structure; hard, friable, slightly sticky and slightly plastic; few fine roots; common fine and few medium tubular pores; moderately alkaline (pH 8.0); clear smooth boundary. (4 to 8 inches thick)

C1ca-21 to 24 inches; light gray (10YR 7/2) light loam, brown (10YR 5/3) moist; weak medium platy structure parting to weak medium angular blocky; very hard, firm, slightly plastic; few fine roots in cracks; common fine and few medium tubular pores; thin very weakly cemented plates with pale brown root mats; strongly calcareous; moderately alkaline (pH 8.2); abrupt smooth boundary. (3 to 5 inches thick)

C2casi-24 to 26 inches; white (10YR 8/2) light loam, grayish brown (10YR 5/2) moist; weak medium platy structure; extremely hard, very firm, common fine tubular pores; 1/4-inch thick very weak cemented and brittle plates; strongly calcareous; moderately alkaline (pH 8.4); clear smooth boundary. (1 to 2 inches thick)

C3ca-26 to 36 inches; white (10YR 8/2) light loam, brown (10YR 5/3) moist; weak medium angular blocky structure; very hard, friable; common fine tubular pores; strongly calcareous; common fine lime veins; moderately alkaline (pH 8.4); gradual smooth boundary. (9 to 12 inches thick)

C4-36 to 60 inches; brown (10YR 5/3) moist light loam; massive; . slightly hard, friable, few fine tubular pores; moderately calcareous; moderately alkaline (pH 8.4).

The 10- to 40-inch control section averages 5 to 18 percent scattered pebbles or cobbles on the surface and in the profile. The mollic epipedon ranges from 7 to 12 inches thick. The B horizon is loam, clay loam, or silty clay loam. Structure is weak prismatic or moderately subangular blocky or moderate angular blocky. The C horizon is a stratified layer of sandy loam, fine sandy loam, and loam that has occasional, thin, intermittent layers of opal-coated material. The Cca horizon has 15 to 20 percent calcium carbonate and extremely hard or very hard dry consistency. The duripan is weakly cemented with 20 to 50 percent of the upper boundary of the plates coated with silica cementation.

Winu series

The Winu series consists of moderately deep, well drained soils that formed in material recently decomposed from sandstone and quartzite. Winu soils are on north-facing mountainsides. Slopes range from 30 to 60 percent. Average annual precipitation is about 18 inches, average annual air temperature is about 40 degrees F, and the frost-free season is about 75 to 90 days.

Winu soils are similar to Kanlee and Vipont soils and are near Hymas, Itca, Mackey, Mulett, and Reywat soils. These soils are in a warmer temperature zone than cryic. Kanlee soils are not pachic. Vipont soils are loamy-skeletal. Hymas, Mackey, and Mulett soils do not have a mollic epipedon. Hymas, Itca, Mulett, and Reywat soils have lithic contact at a depth of less than 20 inches.

Typical pedon of Winu stony silt loam, 30 to 60 percent slopes, in the SE1/4SE1/4 sec. 35, T. 13 S., R. 23 E.:

A11-0 to 8 inches; very dark grayish brown (10YR 3/2) stony silt loam, black (10YR 2/1) moist; strong very fine granular structure; very friable, slightly sticky and slightly plastic; many fine and few medium roots; many very fine interstitial pores; 10 percent stones and 5 percent pebbles; neutral (pH 7.0); clear wavy boundary. (2 to 10 inches thick)

A12-8 to 13 inches; dark grayish brown (10YR 4/2) stony silt loam, very dark brown (10YR 2/2) moist; strong very fine granular structure; very friable, slightly sticky and slightly plastic; many fine and few medium roots; many very fine interstitial pores; neutral (pH 7.0); clear wavy boundary. (1 to 6 inches thick)

B21t-13 to 19 inches; brown (10YR 4/3) gravelly light clay loam, dark brown (10YR 3/3) moist; weak very fine subangular blocky structure; friable, slightly sticky and plastic; common fine and few medium and large roots; common fine tubular pores; thin nearly continuous clay films; 10 percent cobbles and 15 percent pebbles; mildly alkaline (pH 7.4); gradual wavy boundary. (6 to 16 inches thick)

B22t-19 to 23 inches; brown (10YR 5/3) gravelly light clay loam, dark brown (10YR 3/3) moist; weak very fine subangular blocky structure; friable, slightly sticky and plastic; few fine roots; common fine tubular pores; thin patchy clay films; 15 percent cobbles and 25 percent pebbles; mildly alkaline (pH 7.6); abrupt irregular boundary. (3 to 8 inches thick)

R-23 inches; slightly weathered calcareous sandstone; olive brown (2.5Y 4/3) outside and dark gray (N 4/0) inside; soil material in cracks; mildly alkaline (pH 7.6).

Thickness of the solum and depth to bedrock range from 20 to 36 inches. The A1 horizon has value of 3 to 5 dry and 2 or 3 moist and has chroma of 1 or 2. The mollic epipedon is 16 to 25 inches thick and commonly includes the upper part of the Bt horizon. Organic matter content averages 3 to 7 percent in the upper 7 inches of the soil. The Bt horizon has chroma of 2 or 3. The B2t horizon is sandy clay loam, loam, or clay loam in the fine earth fraction and may be gravelly, stony, or cobbly. The argillic horizon averages between 18 and 30 percent clay and more than 15 percent rock fragments.

Wodskow series

The Wodskow series consists of deep, somewhat poorly drained soils that formed in mixed alluvium. Wodskow soils are on valley terraces and in drainageways. Slopes range from 0 to 2 percent. Average annual precipitation is about 9 inches, average annual air temperature is about 49 degrees F, and the frost-free season is about 120 to 140 days.

Wodskow soils are similar to Declo and Escalante soils and are near Abo and Abo Variant soils. Declo and Escalante soils do not have mottles due to segregation of iron or manganese at a depth of less than 40 inches. Abo and Abo Variant soils have an argillic horizon.

Typical pedon of Wodskow sandy loam in an area of Wodskow sandy loam, drained, 560 feet west and 100 feet south of the NE corner of sec. 5, T. 13 S., R. 22 E.:

Ap-0 to 5 inches; light brownish gray (10YR 6/2) sandy loam, dark grayish brown (10YR 4/2) moist; weak coarse platy structure parting to weak fine and very fine granular; slightly hard, friable, slightly sticky and slightly plastic; many fine and vary fine and few medium roots; many very fine and fine interstitial pores; moderately alkaline (pH 8.0); abrupt smooth boundary. (4 to 10 inches thick)

B1-5 to 12 inches; light brownish gray (10YR 6/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; weak medium prismatic structure parting to coarse subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; many very fine and few fine roots; many fine and very fine tubular pores; mildly alkaline (pH 7.8); abrupt smooth boundary. (3 to 9 inches thick)

B2--12 to 15 inches; light gray (10YR 7/2) silt loam, grayish brown (10YR 5/2) moist; weak medium prismatic structure parting to weak medium subangular blocky; soft, very friable, slightly sticky and plastic; common fine roots; many fine tubular pores; slightly calcareous; moderately alkaline (pH 8.2); clear smooth boundary. (3 to 8 inches thick)

C1ca-15 to 34 inches; light gray (10YR 7/2) light loam, grayish brown (10YR 5/2) moist; weak medium and coarse prismatic structure parting to weak coarse subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; common fine and very fine roots; decreasing to few below 22 inches; many fine and vary fine tubular pores; moderately calcareous; moderately alkaline (pH 8.4); abrupt smooth boundary. (12 to 25 inches thick)

C2-34 to 46 inches; light brownish gray (10YR 5/2) loam, brown (10YR 4/3) moist; many fine and medium faint dark yellowish brown (10YR 4/4) moist mottles; massive, slightly hard, friable, slightly sticky and slightly plastic; few fine roots; few fine tubular pores; moderately alkaline (pH 8.3); abrupt smooth boundary. (0 to 12 inches thick)

C3-46 to 57 inches; light gray (10YR 7/2) loam, brawn (10YR 5/3) moist; many large prominent dark yellowish brown (10YR 4/4) moist mottles; massive; slightly hard, friable, slightly sticky and plastic; few fine roots; many fine and very fine tubular pores; slightly calcareous; moderately alkaline (pH 8.3); clear smooth boundary. (0 to 12 inches thick)

C4-57 to 60 inches; light brownish gray (10YR 6/2) loamy very fine sand, dark grayish brown (10YR 4/2) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; moderately alkaline (pH 7.9).

The soil generally has a conductivity of the saturation extract of 2 millimhos per centimeter or more at 25 degrees C in some part of the soil above 35 inches. Unless artificially drained, it is saturated with water in a subhorizon between a depth of 30 and 48 inches for a period in summer. It has dominant chroma of 2 or less accompanied by mottles caused by segregation of iron or manganese within 40 inches of the surface. The 10- to 40-inch control section is dominantly moderately coarse textured and contains less than 15 percent rock fragments. Depth to strongly contrasting texture is more than 40 inches, and the depth to bedrock is more than 60 inches. The soil is noncalcareous in all parts above the calcic horizon after the upper 7 inches of the soil is mixed. The upper boundary of the calcic horizon is at a depth of 15 to 32 inches. The 15 inch surface layer averages more than 0.6 percent organic matter.

The Ap horizon has value of 5 or 6 dry and 3 or 4 moist and has chroma of 2 or 3. It has value that is darker than 5.5 dry and 3.5 moist, both broken and crushed. This horizon ranges from noncalcareous to slightly calcareous. The B horizon has value of 5 to 7 dry and 3 to 5 moist and has chroma of 2 or 3. It is slightly mottled in some pedons. The strongly calcareous Ccaa horizon is white or light gray and has faint or distinct mottles caused by segregation of iron or manganese. The soil may be slightly saline or moderately saline.

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" (8).

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 17, 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 Entisol.

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 Xeroll *(Xer,* refers to moist winters and dry summers, plus *oll,* from Mollisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of 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 Haploxerolls *(Hapl,* meaning simple horizons, plus *xeroll,* the suborder of Mollisols that have a xeric moisture regime).

SUBGROUP. Each great group may be divided into three subgroups: the central (typic) concept of the great groups, 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 groups 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 *Fluventic* identifies the subgroup that has some of the characteristics of the soils of another suborder. An example is Fluventic Haploxerolls. Fluvents are from the order Entisols. *Fluv* means composed of recent alluvium, added.

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 fine-loamy, mixed, mesic Fluventic Haploxerolls.

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.

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Glossary

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.

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.

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.

Colluvium. Soil material, rock fragments, or both moved by creep, slide, or local wash and deposited at the bases of steep slopes.

Complex, soil. A mapping unit of two or more kinds of soil occurring in such an intricate pattern that they cannot be shown separately on a soil map at the selected scale of mapping and publication

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.-Non coherent 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.

Fine.-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).

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 gracing.

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 fret 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 nigh 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 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."

Drainage, surface. Runoff, or surface flow of water, from an areas.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dune:: or to loess in blankets on the surface.

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 fines. Excess silt and clay. The soil does not provide a source of gravel or sand for construction purposes.

Excess salts. Excess water soluble salts. Excessive salts restrict the growth of most plants.

Fallow. Cropland left idle in order to restore productivity through accumulation of moisture. Summer fallow is common in regions of limited rainfall where cereal grains are grown. The soil is tilled for at least one growing season for weed control and decomposition of plant residue.

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_

Frost action. Freezing and thawing of soil moisture. Frost action can damage structures and plant roots.

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.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table, which is the upper limit of saturation.

Hardpan. A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. 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 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. These 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.

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.

Lacustrine deposit (geology). Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Leaching. The removal of soluble material from soil or other material by percolating water.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind.

Low strength. Inadequate strength for supporting loads.

Medium textured soil. Very fine sandy loam, loam, silt loam or silt.

Mottling, soil. Irregular spots of different colors that var3 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 con*trast-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).

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.

Peres 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).

Piping. Moving water of subsurface tunnels or pipelike cavities in the soil.

Playas. Shallow central basins on a plain where water gathers after a rain and is evaporated.

Poor outlets. Surface or subsurface drainage outlets difficult or expensive to install.

Range (or rangeland). Land that, for the most part, produces native plants suitable for grazing by livestock; includes land supporting some forest trees.

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

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*.

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.

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.

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 025 millimeter); *fine sand*

(0.25 to 0.10 millimeter); *very fine sand* (0.10 to 0.05 millimeter); silt (0.005 to 0.002 millimeter); and *clay* (less than 0.00:l millimeter).

Stony. Refers to a soil containing stones in numbers teat 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.

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."

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea. A stream terrace is frequently called a second bottom, in contrast with a flood plain, and is seldom subject to overflow. A marine terrace, generally wide, was deposited by the sea.

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.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Variant, soil. A soil having properties sufficiently different from those of other known soils to justify a new series name, but the limited geographic soil area does not justify creation of a new series.

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.

Illustrations

Figure 1.-Irrigated barley on Buko-Paniogue complex

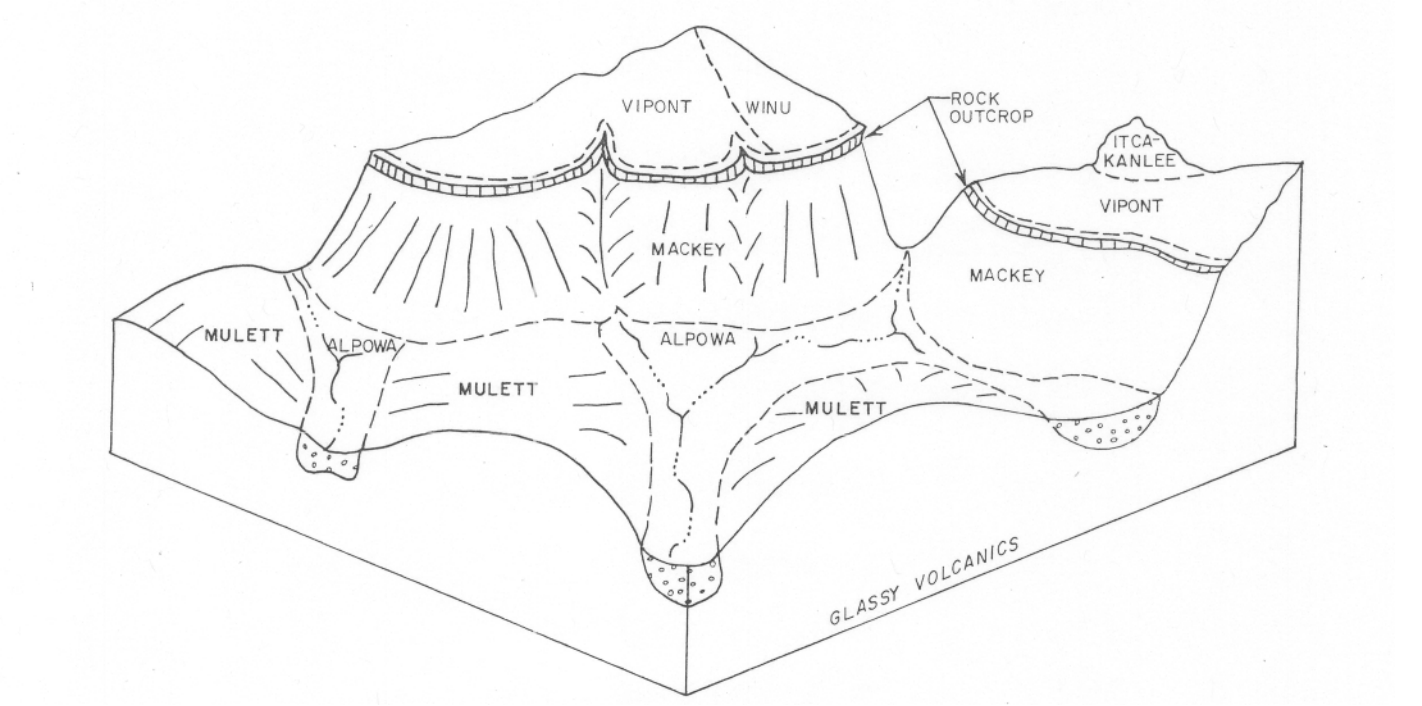

Figure 2.-Representative pattern of soils in Mackey-Mulett map unit.

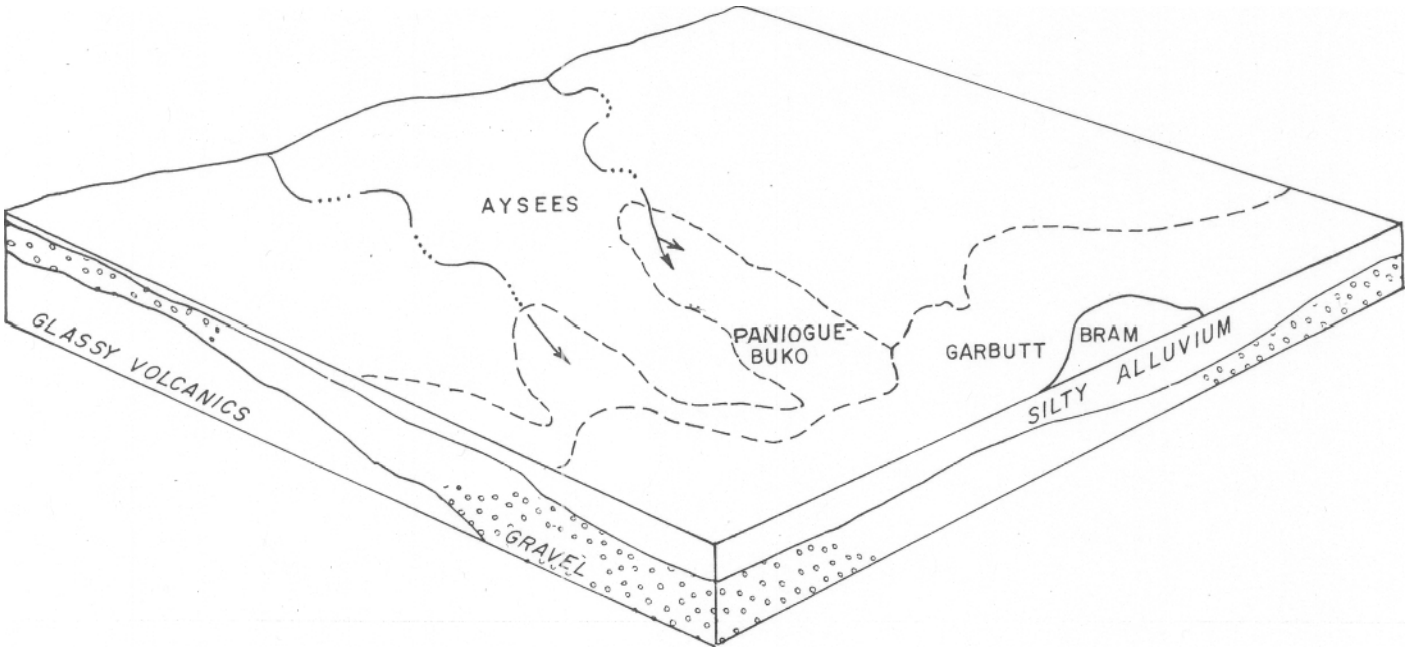

Figure 3.-Representative pattern of soils in Aysees-Garbutt map unit.

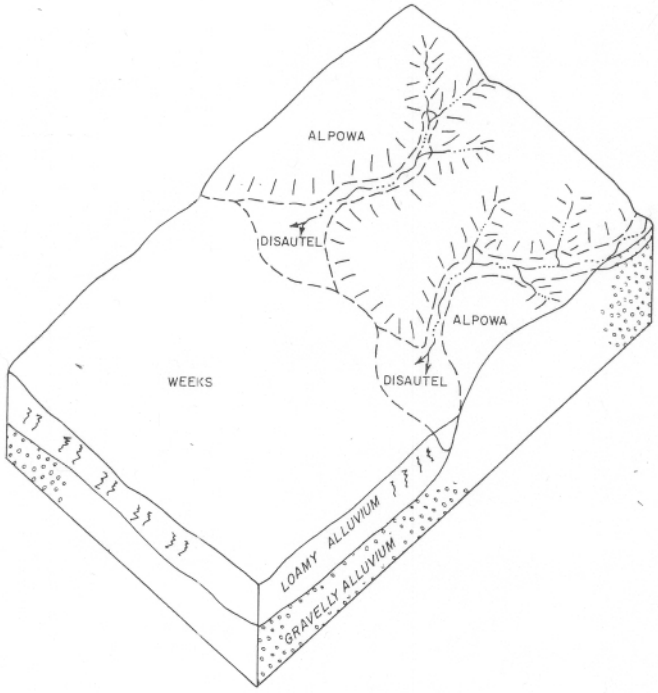

Figure 4--Representative pattern of soils in Weeks-Alpowa map unit.

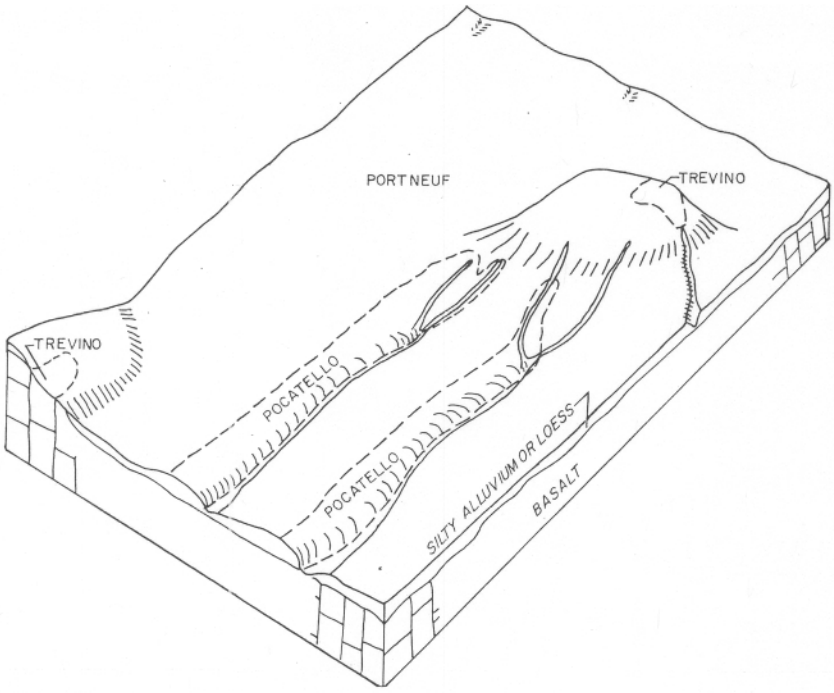

Figure 5.-Representative pattern of soils in Portneuf-Pocatello map unit.

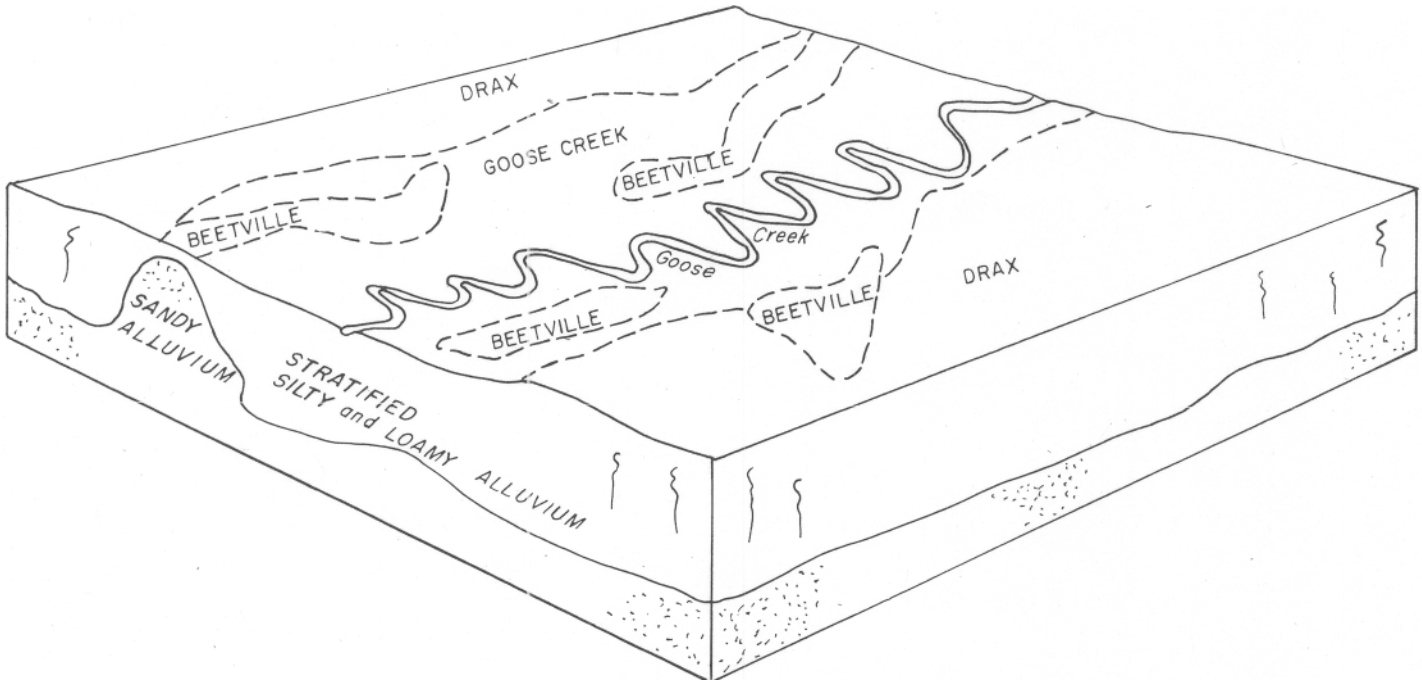

Figure 6-Representative pattern of soils in Drax-Goose Creek-Beetville map unit.

Figure 7.-Soil profile of Abo Variant loam. White crusting is salt.

Figure 8.-The Bedke soils in the foreground are in rangeland reseeded to crested wheatgrass. Hills in the background are Winu stony silt loam, 30 to 60 percent slopes, on north aspects and Vipont very stony loam, 30 to 50 percent slopes, on south aspects.

Figure 9.-Plowed wheat stubble on Disautel loam, l to 3 percent slopes, in foreground. Disautel loam, 3 to 7 percent slopes is in the background.

Figure 10.-Range on Itca-Kanlee complex. Vegetation is sagebrush and bunchgrass. Kanlee soils are in foreground and Itca soils are near the hill crest.

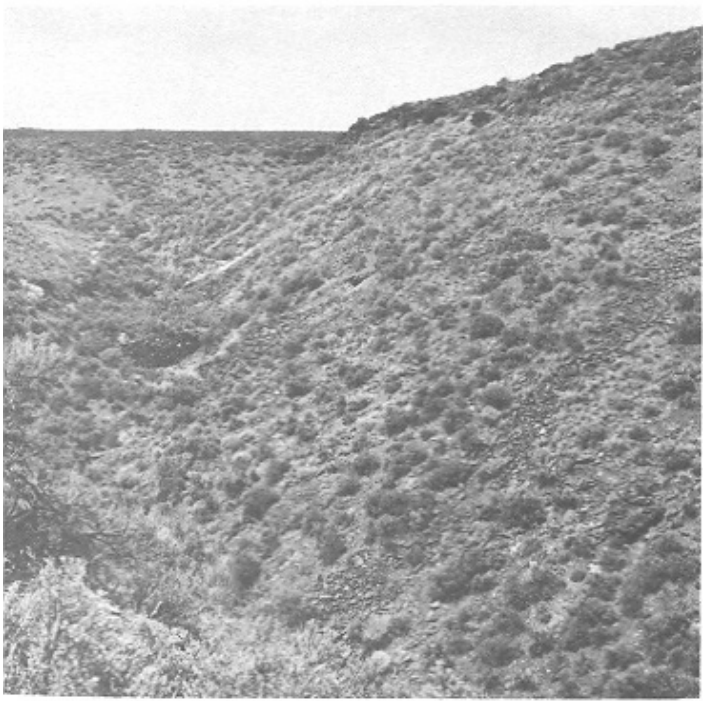

Figure 11.-Mackey-Rock outcrop map unit. Vegetation is sagebrush and bunchgrass.

Figure 12.-Nonirrigated farmland on Neeley silt loam, 4 to 12 percent slopes.

Figure 13.-An area of rangeland on Reywat cobbly loam, 0 to 30 percent slopes. Vegetation is low sagebrush and bunchgrass.

Figure 14.-An area of Weeks loam, 1 to 3 percent slopes in crops. Goose Creek silt loam is in the background.

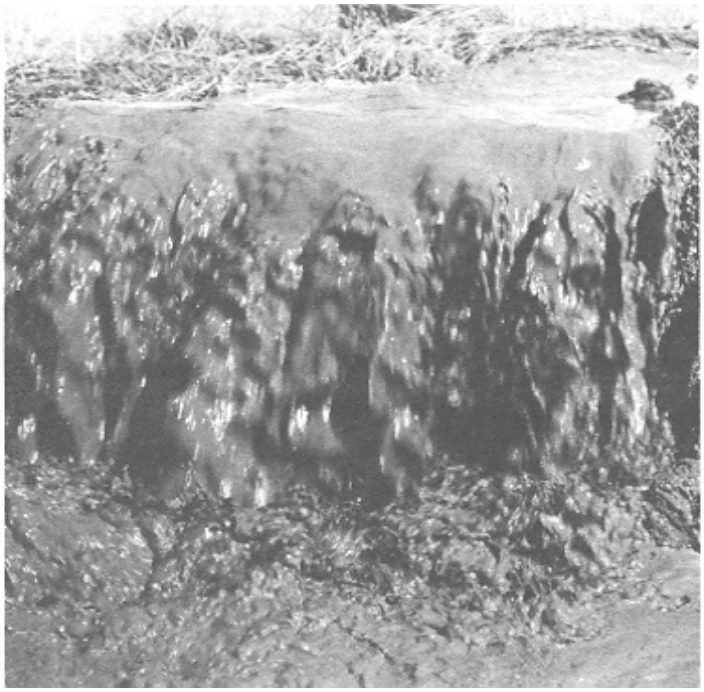

Figure 15.-Runoff of snow melt from Bedke silt loam, 3 to 12 percent slopes. Soils are not protected by good conservation practices.

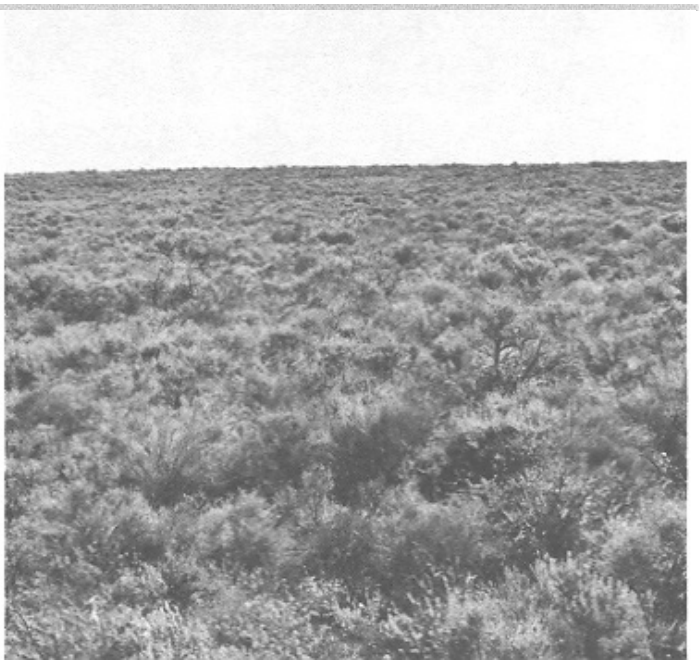

Figure 16.-An area of rangeland on Bedke silt loam, 3 to 12 percent slopes. Vegetation is mostly big sagebrush and bluebunch wheatgrass.

Figure 17.-Profile of Aysees gravelly loam, 1 to 12 percent slopes.

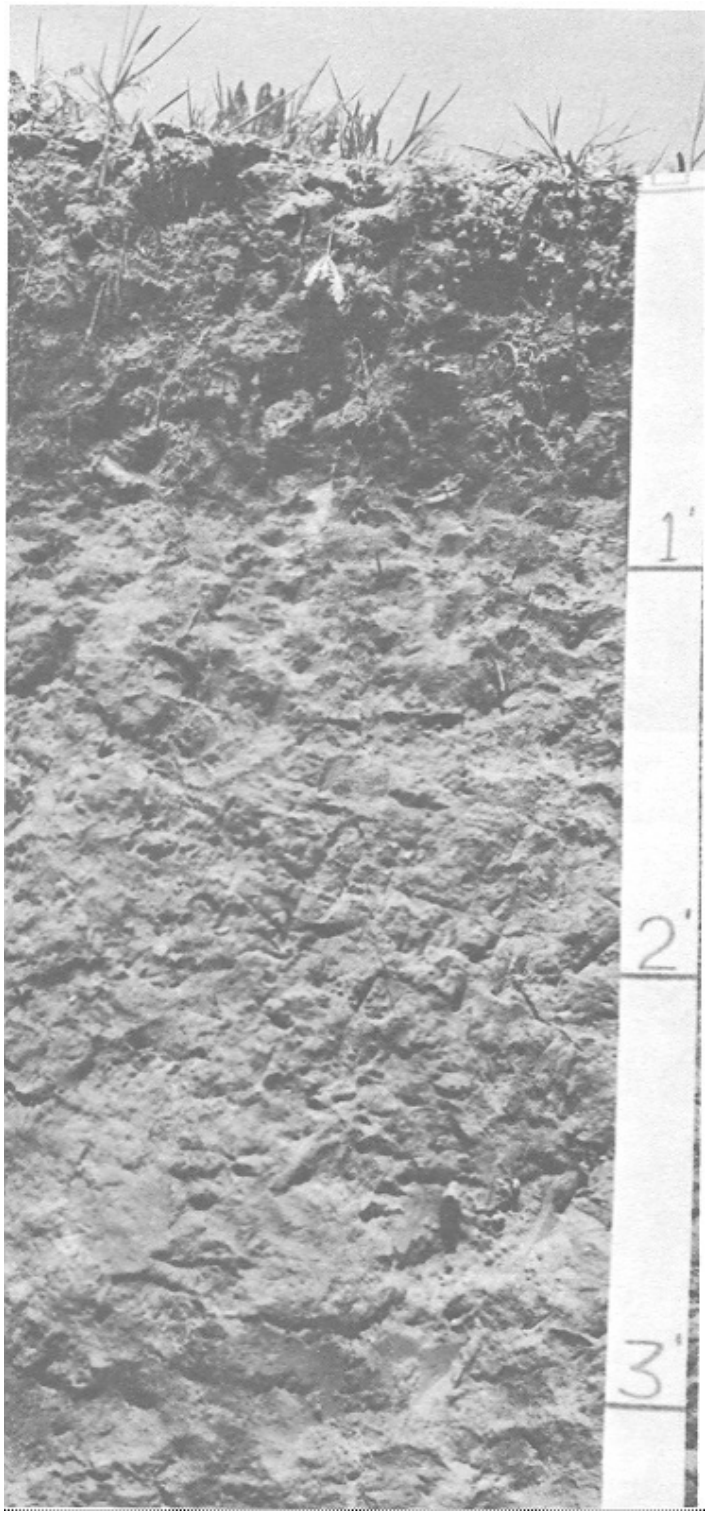

Figure 18.-Profile of Beetville loam.

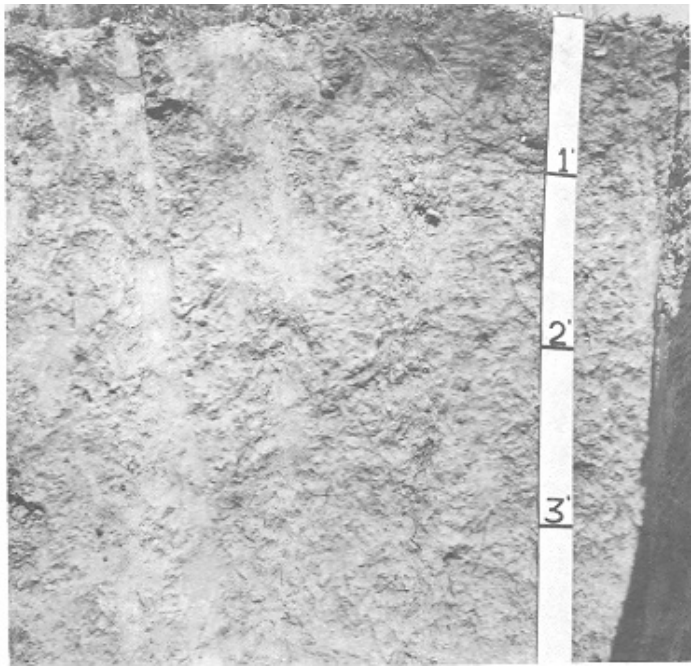

Figure 19.-Profile of Bram silt loam

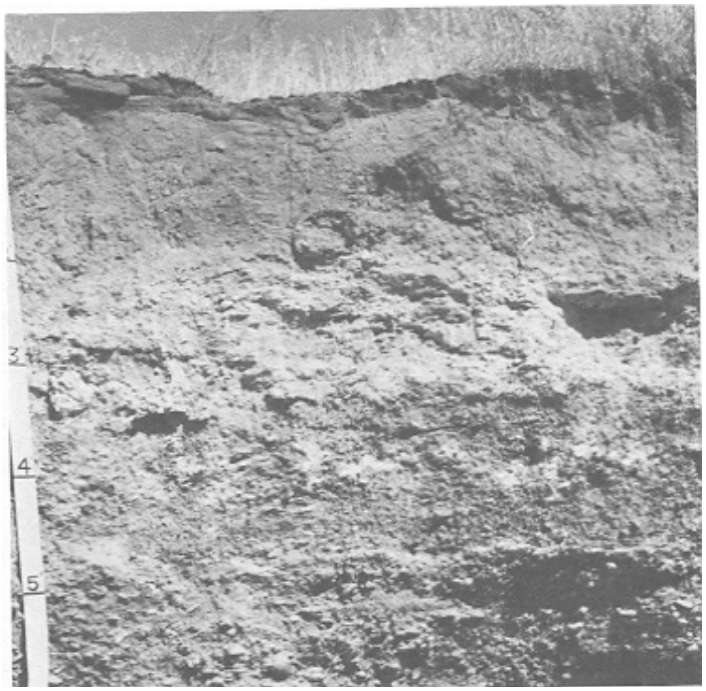

Figure 20.-Profile of Buko loam

Figure 21.-Profile of Mulett very stony loam, 4 to 20 percent slopes.

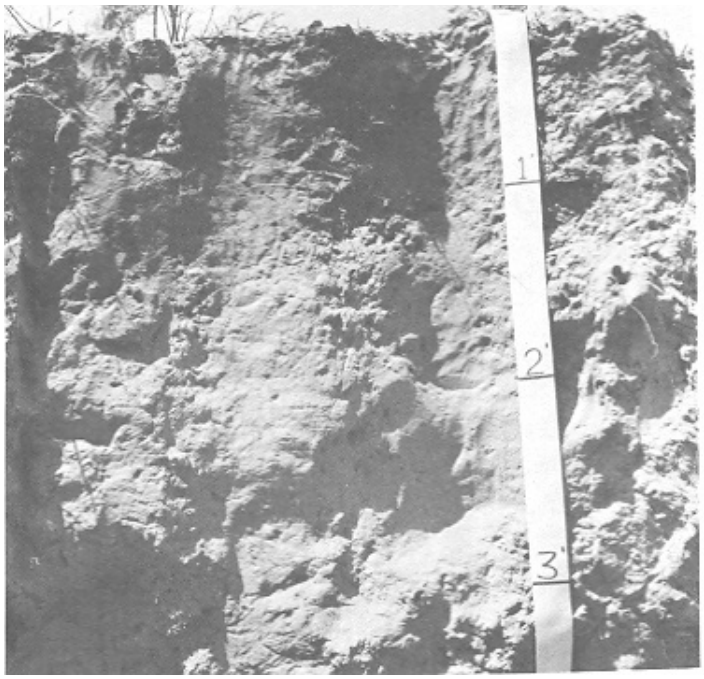

Figure 22.-Profile of a Pocatello silt loam

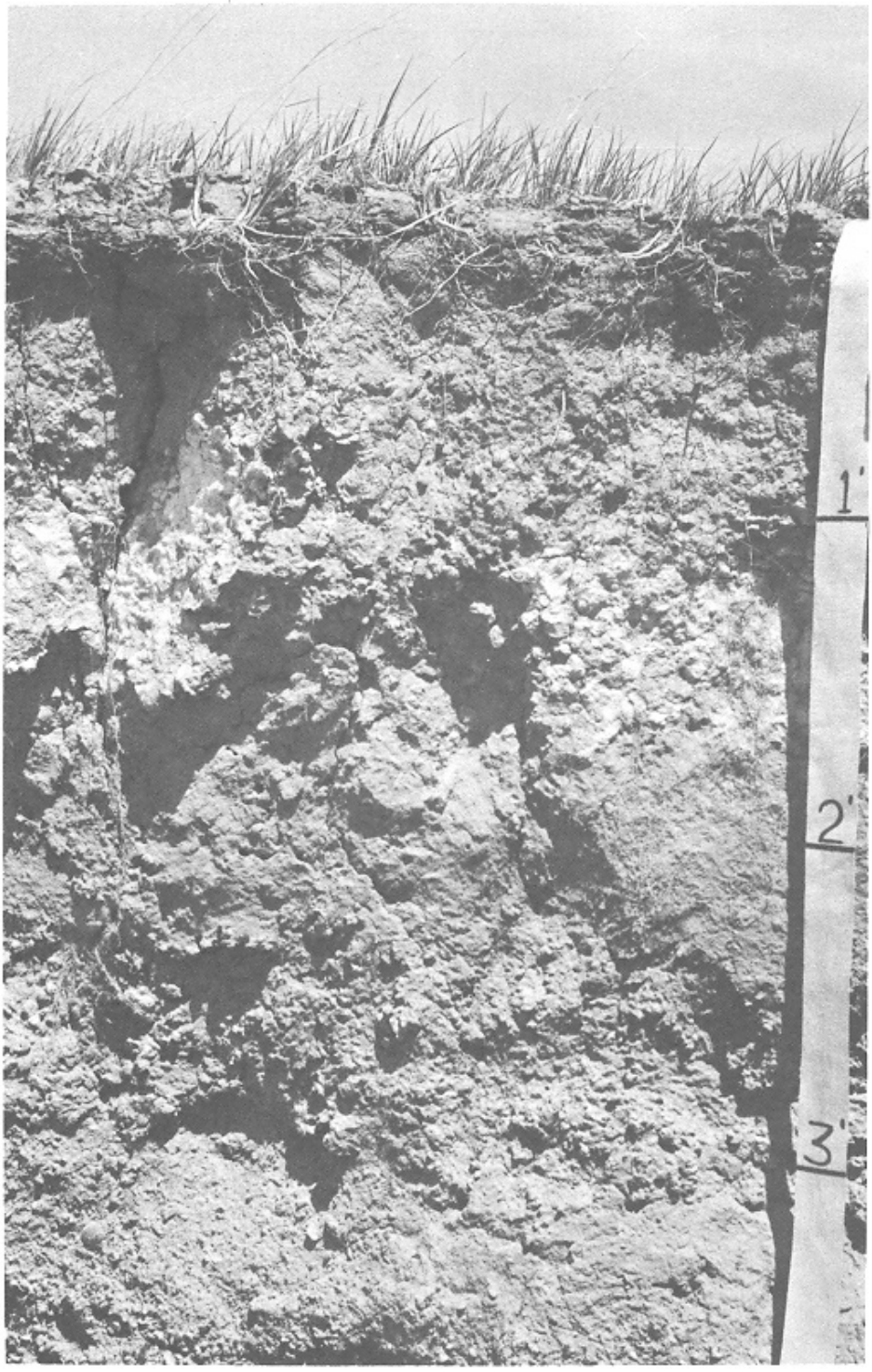

Figure 23.-Profile of Portneuf silt loam.