United States
Department of
Agriculture

Soil
Conservation
Service

In cooperation with
United States Department
of the Interior, Bureau of
Reclamation; and the
Wyoming Agricultural
Experiment Station

Soil Survey of Eden Valley Area, Sweetwater and Sublette Counties, Wyoming

How To Use This Soil Survey

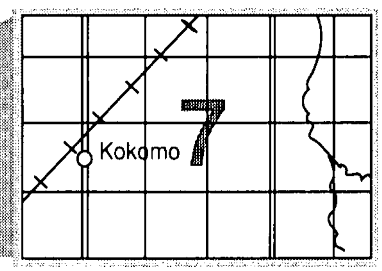
General Soil Map

The general soil map, which is the color map preceding the detailed soil maps, shows the survey area divided into groups of associated soils called general soil map units. This map is useful in planning the use and management of large areas.

To find information about your area of interest, locate that area on the map, identify the name of the map unit in the area on the color-coded map legend, then refer to the section **General Soil Map Units** for a general description of the soils in your area.

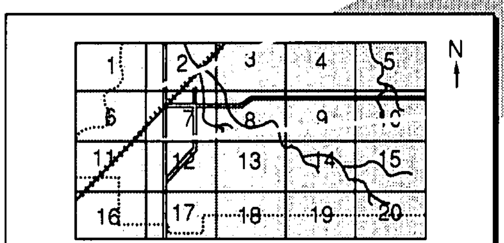
Detailed Soil Maps

The detailed soil maps follow the general soil map. These maps can be useful in planning the use and management of small areas.



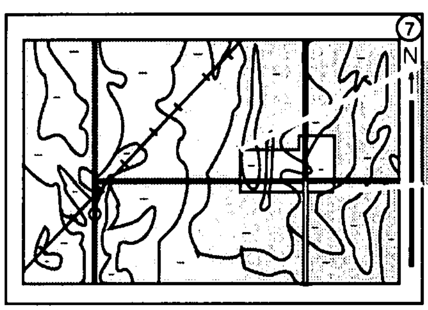
MAP SHEET

To find information about your area of interest, locate that area on the **Index to Map Sheets**, which precedes the soil maps. Note the number of the map sheet, and turn to that sheet.

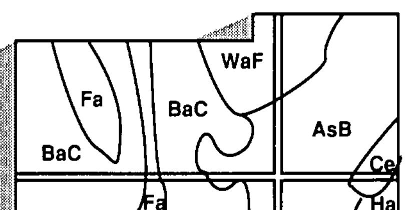


INDEX TO MAP SHEETS

Locate your area of interest on the map sheet. Note the map unit symbols that are in that area. Turn to the **Index to Map Units** (see Contents), which lists the map units by symbol and name and shows the page where each map unit is described.



MAP SHEET



AREA OF INTEREST

NOTE: Map unit symbols in a soil survey may consist only of numbers or letters, or they may be a combination of numbers and letters.

The **Summary of Tables** shows which table has data on a specific land use for each detailed soil map unit. See **Contents** for sections of this publication that may address your specific needs.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other federal agencies, state agencies including the Agricultural Experiment Stations, and local agencies. The Soil Conservation Service has leadership for the federal part of the National Cooperative Soil Survey.

Major fieldwork for this soil survey was completed in 1984. Soil names and descriptions were approved in 1985. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1984. This survey was made cooperatively by the United States Department of Agriculture, Soil Conservation Service; the United States Department of the Interior, Bureau of Reclamation; and the Wyoming Agricultural Experiment Station. It is part of the technical assistance furnished to the Big Sandy Conservation District. This survey comprises the Eden Valley Irrigation and Drainage District.

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

All programs and services of the Soil Conservation Service are offered on a nondiscriminatory basis, without regard to race, color, national origin, religion, sex, age, marital status, or handicap.

Cover: Irrigated field and farmstead in Eden Valley. In the foreground is a hayfield in an area of Forelle sandy loam, 0 to 1 percent slopes. The farmstead in the background is in an area of Vonason loamy sand, 0 to 1 percent slopes.

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Issued October 1990

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Foreword

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

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

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow over bedrock. Some are too unstable to be used as a foundation for buildings or roads. 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 soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Soil Conservation Service or the Cooperative Extension Service.

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State Conservationist
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Soil Survey of Eden Valley Area, Sweetwater and Sublette Counties, Wyoming

By Halvor B. Ravenholt and Donald J. Lewis, Soil Conservation Service

United States Department of Agriculture, Soil Conservation Service,
in cooperation with
United States Department of the Interior, Bureau of Reclamation; and the Wyoming Agricultural Experiment Station

General Nature of the Survey Area

The survey area is in the southwestern part of Wyoming (fig. 1). It is in the north-central part of Sweetwater County and the south-central part of Sublette County. The survey area has a total area of 76,920 acres. About 73,040 acres is in Sweetwater County and 3,880 acres is in Sublette County. Of the total acreage, about 34,000 acres is deeded land, 1,880 acres is state land, and 41,040 is federal land. The area is approximately 21 miles long and 8 miles wide. In 1950, the population of Eden Valley was 381. In 1980, it was 379.

The valley is served by U.S. Highway 191 and Wyoming Highway 26. Bus routes from Rock Springs to Jackson and from Rock Springs to Lander pass through Farson. A landing strip for small private planes is 1 mile northwest of Farson. A railroad and Interstate Highway 80 pass through Rock Springs, 40 miles south of Farson.

Hay, oats, and barley are grown in the irrigated areas as feed for cattle and sheep and for horses that graze on the adjacent rangeland. Farming is the only commercial activity in the area. There is virtually no industry.

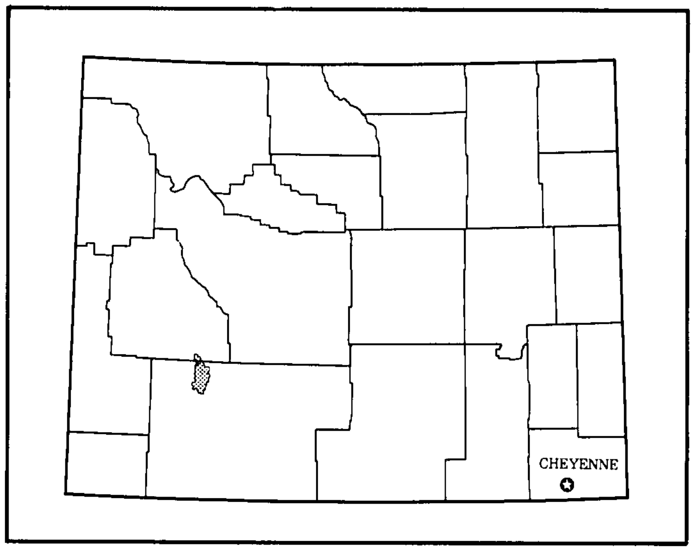

Figure 1.—Location of the Eden Valley area in Wyoming.

History and Development

Initially, the survey area was used as summer hunting territory by the Shoshone Indians. Fur trappers traveled through the area in the 1820's and 1830's. The Oregon Trail, which passed through Eden Valley, was used during the 1840's until a railroad was established in 1868 about 40 miles south of Farson.

In 1883, George Crawford, an engineer, began conducting surveys that eventually resulted in the formation of the Eden Irrigation and Land Company. In 1907, additional emphasis was given to irrigation development by the Carey Act and by promoters and companies. Under the guidance of the Bureau of Reclamation, construction of Big Sandy Dam began in 1940. The United States involvement in World War II, however, delayed completion of the dam until 1950, at which time the Eden Valley Irrigation and Drainage District was formed. Since that time, irrigation systems have been improved.

Physiography, Relief, and Drainage

The survey area is a high valley that is part of the Green River Basin within the Middle Rocky Mountain Physiographic Province. It is an area of low relief. It is generally a nearly level plain between 6,550 and 6,720 feet in elevation. The elevation ranges from 6,510 feet on the west side, where the Big Sandy River leaves the area, to 6,850 feet on top of a low butte in the northeastern part.

Most areas in the valley proper have a mantle of mixed alluvium. Some of this alluvium originated on the foot slopes of the Wind River Range at the headwaters of the Big Sandy River, Little Sandy Creek, Pacific Creek, and Jack Morrow Creek. Some of the alluvium washed in from areas of sedimentary rocks. Underlying this alluvial mantle are sandstone and shale of the Lander member of the Green River Formation and the Bridger Formation. The sandstone and shale are exposed along streambanks and in the higher areas that were never mantled.

Little Sandy Creek, Pacific Creek, and Jack Morrow Creek empty into the Big Sandy River, which empties into the Green River, a tributary of the Colorado River.

Climate

Eden Valley has a semiarid climate. The mean annual precipitation is 7.45 inches. The greatest amount of precipitation, an average of 1.02 inches, falls in May. An average of 0.4 to 1.0 inch falls monthly during the rest of the year.

The mean annual air temperature is about 38 degrees F. January has an average high temperature of 25.9 degrees F and an average low temperature of -6.4 degrees F. July has an average high temperature of 83.5 degrees F and an average low temperature of 44.2 degrees F. Extreme temperatures of -41 degrees F and 96 degrees F have been recorded. Temperatures can drop to 32 degrees F any month of the year, but the average frost-free season is about 60 days. The average growing season is about 90 days at the 28-degree level and about 120 days at the 24-degree level. Table 1 gives the data on temperature and precipitation.

Evaporation averages 45 inches for the period May through September. The sun shines an average of 65 percent of the time possible during the year. Winds are mainly westerly and average 13 miles per hour annually. They are generally stronger in the daytime than at nighttime. Storms with gusts as high as 75 miles per hour have occurred.

How This Survey Was Made

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

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

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

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

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

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

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

General Soil Map Units

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

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

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

Map Unit Descriptions

1. Worfman-Sobson-Pepton Association

Shallow and moderately deep, well drained, level to gently sloping soils; on upland plains

The soils in this association formed in residuum. Some steep slopes and escarpments are along streams. The native vegetation is shrubs, forbs, and grasses.

This association makes up about 21 percent of the survey area. It is about 29 percent Worfman and similar soils, 18 percent Sobson and similar soils, 18 percent Pepton and similar soils, and 35 percent minor soils. The minor soils are Diamondville, Edlin, Elk Mountain, Haterton, Huguston, Means, and Shellcreek soils and Fluvaquents.

Worfman soils are shallow to shale bedrock. They have a sandy loam surface layer and a clay loam subsoil. Sobson soils are moderately deep to shale bedrock. They have a sandy loam surface layer and subsoil. A layer of channery sandy loam is directly above the shale. Pepton soils are shallow to hard sandstone. They have a sandy loam surface layer and subsoil.

Nearly all of this association is used for range. A few small areas are used as irrigated cropland. This association should be left in range.

This association provides winter habitat for moose in the northern third of the survey area and for elk in an area along the west side of the Big Sandy Reservoir. It provides critical winter habitat for antelope and year-round habitat for antelope and mule deer. A major antelope migration route crosses this association directly south of the Big Sandy Reservoir. Sage grouse use the association extensively for breeding complexes and winter habitat. The association also is inhabited by coyote, red fox, sagebrush vole, deer mouse, white-tailed prairie dog, white-tailed jackrabbit, desert cottontail, sagebrush lizard, and birds common to shrub steppes and grassland prairies.

2. Edlin-Kandaly-Youjay Association

Very deep and shallow, well drained and somewhat excessively drained, level to moderately steep soils; on alluvial fans and upland plains that have intermittent sand dunes

The soils in this association are in the northern part of the survey area and along the eastern side, north of Pacific Creek. The native vegetation is shrubs, forbs, and grasses.

This association makes up about 1 percent of the survey area. It is about 20 percent Edlin soils, 20 percent Kandaly soils, 20 percent Youjay soils, and 40 percent minor soils and rock outcrop. The minor soils are Elk Mountain, Haterton, Huguston, Means, and Shellcreek soils.

Edlin soils are very deep and well drained. They are fine sandy loam and sandy loam throughout. They are on toe slopes. Kandaly soils are very deep and somewhat excessively drained. They are fine sand throughout. They occur as intermittent dunes. Youjay soils are shallow and well drained. They have a clay loam surface layer and a clay and very shaly clay loam subsoil.

All of this association is used for range. It is best suited to this use.

This association provides winter habitat for elk on the west side of the Big Sandy Reservoir. It also provides critical winter habitat and year-round habitat for antelope and winter habitat for sage grouse. The association is inhabited by sagebrush vole, deer mouse, white-tailed prairie dog, raccoon, striped skunk, coyote, red fox, white-tailed jackrabbit, desert cottontail, sagebrush lizard, and birds common to shrub steppes and grassland prairies.

3. Farson-Vonason-Farson, Wet, Association

Very deep, well drained and moderately well drained, level to gently sloping soils; on valley floors and fan terraces

This association is the most extentive association in the survey area. Generally, the landscape is level to gently sloping, except for scattered small areas of steeper slopes and low scarps along streams and drainageways. The native vegetation is shrubs, forbs, and grasses.

This association makes up about 59 percent of the survey area. It is about 43 percent Farson soils that are not wet and similar soils, 32 percent Vonason and similar soils, 8 percent Farson soils that are wet, and 17 percent minor soils. The minor soils are Bosler, Cotopaxi, Elk Mountain, Gunbarrel, Hooper, Littlebear, Means, and Means Variant soils.

The Farson soils that are not wet have a sandy loam surface layer and subsoil and a coarse sand and gravelly sand substratum. They are level to gently sloping. Vonason soils have a loamy sand surface layer, a sandy loam subsoil, and a gravelly loamy sand substratum. They are level to gently sloping. The Farson soils that are wet are similar to the other Farson soils, except for an irrigation-induced water table at a depth of 3 to 4 feet. They are level.

About half of this association is used as irrigated cropland. Grass hay, alfalfa hay, barley, and oats are the main crops. More than 90 percent of the irrigated cropland in the survey area is in this association. Border dike, border ditch, and contour ditch are the most common methods of irrigation. Sprinkler irrigation is a more efficient method, however, because of moderate or moderately rapid permeability and a low available water capacity.

This association provides winter habitat for moose in the northern third of the survey area. It provides critical winter habitat for antelope and year-round habitat for antelope and mule deer. Sage grouse use the association extensively for breeding complexes, brood rearing, and winter habitat. The association also is inhabited by coyote, red fox, sagebrush vole, deer mouse, white-tailed prairie dog, white-tailed jackrabbit, desert cottontail, sagebrush lizard, and birds common to shrub steppes and grassland prairies. A large area of irrigation-induced wetlands is inhabited by many species of waterfowl.

4. Edlin-Cotopaxi-Forelle Association

Very deep, well drained and somewhat excessively drained, level to moderately steep soils; on alluvial fans that have intermittent sand dunes

The soils in this association formed in alluvium and eolian material. The native vegetation is shrubs, forbs, and grasses.

This association makes up about 2 percent of the survey area. It is about 70 percent Edlin soils, 13 percent Cotopaxi soils, 7 percent Forelle soils, and 10 percent minor soils. The minor soils are Diamondville, Elk Mountain, Sobson, and Worfman soils.

Edlin and Forelle soils are well drained. They are level to gently sloping. Edlin soils have a fine sandy loam surface layer and a sandy loam subsoil. Forelle soils have a sandy loam surface layer, a clay loam subsoil, and a loam substratum. In some areas they have loamy sand at a depth of about 4 feet. Cotopaxi soils are somewhat excessively drained and are on dunes. They are fine sand throughout.

Most of this association is used for range. Some areas are used as irrigated cropland. Grass hay, alfalfa hay, barley, and oats are the main crops. The association is well suited to irrigation. Sprinkler irrigation is the best method of water application on the Edlin soils because of moderately rapid permeability.

This association provides critical winter habitat and year-round habitat for antelope and winter habitat for sage grouse. It is inhabited by sagebrush vole, deer mouse, white-tailed prairie dog, raccoon, striped skunk, coyote, red fox, white-tailed jackrabbit, desert cottontail, sagebrush lizard, and birds common to shrub steppes and grassland prairies.

5. Mishak-Littlebear-Quealman Association

Very deep, moderately well drained to poorly drained, level and nearly level soils; on bottom land and in depressions on valley floors

The soils in this association are along the major streams and the lesser drainageways and in depressions. Generally, the landscape is level and nearly level, except for very short slopes along the streams and drainageways. The native vegetation is mainly salt-tolerant plants, such as greasewood and inland saltgrass, interspersed with other shrubs, forbs, and grasses.

This association makes up about 10 percent of the survey area. It is about 22 percent Mishak soils, 20 percent Littlebear and similar soils, 12 percent Quealman soils, and 46 percent minor soils. The minor soils are Bosler, Clowers, Debone, Debone Variant, Edlin, Forelle, Gunbarrel, Hooper, Shellcreek Variant, Space City, and Vonason soils.

Mishak soils are somewhat poorly drained and poorly drained. A white salt crust is on their surface for part of the year. These soils have a fine sandy loam surface layer, a sandy clay loam subsoil, and a substratum of stratified fine sandy loam, sandy clay loam, and clay loam. They are mainly in wet depressions. Littlebear soils are moderately well drained. They are stratified loamy sand and sandy loam in the upper part and gravelly sand and sand in the substratum. Some of the strata are strongly alkaline. Quealman soils are moderately well drained. They are dominantly stratified fine sandy loam, loamy fine sand, loam, and sand but have thin layers of finer textured material.

Nearly all of this association is used for range or native pasture. Because of the hazard of flooding, very few buildings are constructed on these soils.

This association provides winter habitat for moose in the northern third of the survey area. It provides critical winter habitat for antelope and year-round habitat for antelope and mule deer. A major antelope migration route crosses this association directly south of the Big Sandy Reservoir. Sage grouse use the association extensively for breeding complexes and winter habitat. The association also is inhabited by coyote, red fox, striped skunk, long-tailed vole, muskrat, deer mouse, white-tailed prairie dog, white-tailed jackrabbit, desert cottontail, water shrew, and birds common to shrub steppes, grassland prairies, and riparian areas.

6. Space City-Vonason-Cotopaxi Association

Very deep, well drained and somewhat excessively drained, level to moderately steep soils; on terrace scarps and valley floors that have intermittent sand dunes

This association is south of the Big Sandy River, Little Sandy Creek, and Pacific Creek in the southeastern part of the survey area. Generally, the landscape is level to moderately steep, except for interspersed sand dunes that are 2 to 8 feet high. The native vegetation is shrubs, forbs, and grasses.

This association makes up about 3 percent of the survey area. It is about 43 percent Space City soils, 25 percent Vonason soils, 16 percent Cotopaxi soils, and 16 percent minor soils. The minor soils are Farson soils that are not wet, Farson soils that are wet, and Gunbarrel, Kandaly, and Littlebear soils.

Space City soils are somewhat excessively drained. They are loamy sand throughout. They are nearly level to moderately steep. Vonason soils are well drained. They have a loamy sand surface layer, a sandy loam subsoil, and a gravelly loamy sand substratum. They are level to gently sloping. Cotopaxi soils are somewhat excessively drained. They are fine sand throughout. They occur as intermittent dunes on the valley floors.

Nearly all of this association is used for range. A few small areas are used as irrigated cropland. The association is best suited to range. If the range is converted to cropland, the hazard of wind erosion is high. Sprinkler irrigation is the best method of water application because of moderately rapid or rapid permeability and a low available water capacity.

This association provides year-round habitat for mule deer and critical winter habitat and year-round habitat for antelope. It provides winter habitat for sage grouse. The association also is inhabited by sagebrush vole, deer mouse, white-tailed prairie dog, raccoon, striped skunk, coyote, red fox, white-tailed jackrabbit, desert cottontail, sagebrush lizard, and birds common to shrub steppes and grassland prairies.

7. Debone Variant-Shellcreek Variant-Hooper Association

Very deep, moderately well drained, level and nearly level, saline-alkali soils; on valley floors

The soils in this association are along the eastern edge of the survey area. They formed in dominantly clayey alluvial and lacustrine sediments. The native vegetation is salt-tolerant shrubs, forbs, and grasses.

This association makes up about 4 percent of the survey area. It is about 30 percent Debone Variant soils, 30 percent Shellcreek Variant soils, 13 percent Hooper soils that are not overblown, 12 percent Hooper soils that are overblown, and 15 percent minor soils. The minor soils are Debone, Gunbarrel, Kandaly, Mishak, and Mishak Variant soils.

Debone Variant soils have a silty clay loam surface layer and a silty clay subsoil and substratum. Shellcreek Variant soils have a thin white coating of salt on the surface. They have a silty clay surface layer and subsoil and a clay loam and loam substratum. The Hooper soils that are not overblown have a clay loam surface layer, a clay or clay loam subsoil, and a sandy clay loam substratum. The Hooper soils that are overblown have small coppice dunes of loamy fine sand about 9 inches high. They support greasewood and other vegetation that stabilizes the dunes.

All of this association is used for range. It is too saline or too alkaline to be used as cropland. Reclamation would be extremely difficult because of slow or very slow permeability and the landscape position of the soils.

This association provides critical winter habitat and year-round habitat for antelope. It also is occasionally inhabited by birds and mammals common to the adjacent shrub steppes and grassland prairies.

Detailed Soil Map Units

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

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

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

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

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

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

Soils of one series can differ in texture of the surface layer or of the underlying layers. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Farson sandy loam, wet, 0 to 1 percent slopes, is a phase of the Farson series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes. A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils are somewhat similar in all areas. Edlin-Huguston complex, 6 to 30 percent slopes, is an example.

This survey includes *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Pits, borrow and gravel, is an example.

Table 2 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of Tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils or miscellaneous areas.

Map Unit Descriptions

50—Bosler sandy loam, 0 to 1 percent slopes. This level, very deep, well drained soil is on valley floors and alluvial fans. Individual areas are irregular in shape and range from 50 to 200 acres in size. The native vegetation is shrubs, forbs, and grasses.

Included in this unit in mapping are small areas of Farson and Hooper soils. These soils are on the valley floors and alluvial fans. They make up about 15 percent of the unit. The percentage varies from one area to another.

Typically, the Bosler soil has a surface layer of grayish brown sandy loam about 10 inches thick. The subsoil is grayish brown clay loam about 16 inches thick. The substratum to a depth of 60 inches is light brownish gray coarse sand. In some small areas where land leveling has occurred, the surface layer has been removed.

Permeability is moderate. The available water capacity is 6 to 7 inches. The effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of wind erosion is moderate.

Most of this unit is irrigated cropland. The unit provides habitat for wildlife.

This unit is well suited to irrigated cropland. The main management concerns are the moderate available water capacity and the moderate hazard of wind erosion. Border dike and sprinkler irrigation methods are suitable. Sprinkler irrigation is the most efficient method. Leaving crop residue on the surface helps to control wind erosion. Incorporating crop residue and other organic material into the soil improves tilth and increases the rate of water infiltration.

This unit is well suited to homesites. Septic tank absorption fields function well, but the effluent can pollute ground water because of the highly porous substratum. The sides of shallow excavations may cave in.

The capability subclass is VIs, dryland, and IVs, irrigated; Sandy range site; irrigation design group 14; windbreak suitability group 6G.

51—Bosler-Hooper complex, 0 to 2 percent slopes. This map unit is on level and nearly level terraces and the valley floors throughout the survey area. The native vegetation is shrubs, forbs, and grasses. Individual areas are irregular in shape and range from 5 to 200 acres in size. They are about 60 percent Bosler sandy loam and 30 percent Hooper clay loam. The components of this unit occur as areas so intricately intermingled that mapping them separately was not practical.

Included with these soils in mapping are small areas of Farson and Debone Variant soils. These soils are on terraces and valley floors. They make up about 10 percent of the unit. The percentage varies from one area to another.

The Bosler soil is very deep and well drained. Typically, the surface layer is grayish brown sandy loam about 5 inches thick. The upper part of the subsoil is brown clay loam about 7 inches thick. The lower part is light olive brown and pale olive loam about 8 inches thick. The upper part of the substratum is light gray loamy fine sand about 28 inches thick. The lower part to a depth of 60 inches is light brownish gray sand.

Permeability is moderate in the Bosler soil. The available water capacity is 6 to 7 inches. The effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of wind erosion is moderate.

The Hooper soil is very deep and moderately well drained. Typically, the surface layer is light brownish gray clay loam about 2 inches thick. The subsoil is very strongly alkaline. The upper 3 inches is brown clay, and the lower 13 inches is pale brown clay loam. The upper part of the substratum is brown sandy clay loam about 10 inches thick. The lower part to a depth of 60 inches is light brownish gray gravelly sand.

Permeability is very slow in the Hooper soil. The available water capacity is 4 to 5 inches. The effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of wind erosion also is slight. The seasonal high water table is at a depth of 4 to 6 feet.

About half of this unit is rangeland, and half is cropland. The unit provides food and cover for antelope, deer, sage grouse, rabbits, other small mammals, and birds.

The potential plant community on the Bosler soil is mainly thickspike wheatgrass, needleandthread, Indian ricegrass, big sagebrush, and rubber rabbitbrush. The production of air-dry vegetation is about 500 pounds per acre in normal years. It ranges from 300 pounds in unfavorable years to 700 pounds in favorable years.

The potential plant community on the Hooper soil is mainly western wheatgrass, Indian ricegrass, basin wildrye, greasewood, and gardner saltbush. The production of air-dry vegetation is about 700 pounds per acre in normal years. It ranges from 400 pounds in unfavorable years to 900 pounds in favorable years.

If the quality of the vegetation on this unit deteriorates because of overgrazing, shrubs and unpalatable forbs increase in abundance. Under further deterioration, annual weeds invade the unit. Suitable management practices are deferred grazing, rotation grazing, and brush control. The main limitation affecting range seeding is the low precipitation.

In areas where this unit is cropped, border dike, border ditch, and sprinkler irrigation methods are suitable. Sprinkler irrigation is the most efficient method. Leaving crop residue on the surface helps to control wind erosion. Incorporating crop residue and other organic material into the soil improves tilth and increases the rate of water infiltration.

This unit is suited to homesites. Septic tank absorption fields function well on the Bosler soil, but the effluent can pollute ground water because of the porous substratum. The Hooper soil is limited as a site for septic tank absorption fields because of the depth to the water table. The sides of shallow excavations in both soils are likely to cave in.

The Bosler soil is in capability subclass VIe, dryland, and IVe, irrigated; Loamy range site; irrigation design group 14. The Hooper soil is in capability subclass VIs, dryland, and IVs, irrigated; Saline Lowland, Drained, range site; irrigation design group 5.

52—Clowers-Debone-Edlin complex, 0 to 3 percent slopes. This map unit is on level and nearly level alluvial fans in the southern part of the survey area. The Clowers and Debone soils are subject to rare flooding. The native vegetation is shrubs, forbs, and grasses. Individual areas are long and narrow and range from 40 to 100 acres in size. They are about 40 percent Clowers loam, 30 percent Debone clay loam, and 20 percent Edlin fine sandy loam. The components of this unit occur as areas so intricately intermingled that mapping them separately was not practical.

Included in this unit in mapping are small areas of Debone Variant, Forelle, and Quealman soils on alluvial fans. These soils make up about 10 percent of the unit. The percentage varies from one area to another.

The Clowers soil is very deep and moderately well drained. Typically, the surface layer is grayish brown loam about 12 inches thick. It has thin lenses and pockets of loamy sand. The next layer is brown clay loam about 16 inches thick. The substratum to a depth of 60 inches is light yellowish brown, stratified clay loam and sandy loam.

Permeability is moderate in the Clowers soil. The available water capacity is 10 to 11 inches. The effective rooting depth is 60 inches or more.

The Debone soil is very deep and moderately well drained. Typically, the surface layer is brown clay loam about 2 inches thick. The subsoil is brown clay about 11 inches thick. The substratum to a depth of 60 inches is light olive brown, stratified fine sandy loam and gravelly sandy loam.

Permeability is slow in the Debone soil. The available water capacity is 6 to 8 inches. The effective rooting depth is 60 inches or more.

The Edlin soil is very deep and well drained. Typically, the surface layer is grayish brown fine sandy loam about 3 inches thick. The subsurface layer is brown fine sandy loam about 10 inches thick. The next layer is pale brown fine sandy loam about 33 inches thick. The substratum to a depth of 60 inches is light brownish gray loamy fine sand.

Permeability is moderately rapid in the Edlin soil. The available water capacity is 6 to 8 inches. The effective rooting depth is 60 inches or more.

Runoff is slow on all three soils. The hazard of water erosion is slight in all areas, except for the drainage channels where some stream cutting has occurred. The hazard of wind erosion is moderate.

All of this unit is rangeland. It provides cover for antelope, sage grouse, rabbits, other small mammals, and birds.

The potential plant community on the Clowers soil is mainly thickspike wheatgrass, needleandthread, Indian ricegrass, and big sagebrush. The production of air-dry vegetation is about 500 pounds per acre in normal years. It ranges from 300 pounds in unfavorable years to 700 pounds in favorable years.

The potential plant community on the Debone soil is mainly western wheatgrass, Indian ricegrass, basin wildrye, greasewood, and gardner saltbush. The production of air-dry vegetation is about 700 pounds per acre in normal years. It ranges from 400 pounds in unfavorable years to 900 pounds in favorable years.

The potential plant community on the Edlin soil is mainly needleandthread, Indian ricegrass, thickspike wheatgrass, big sagebrush, and low rabbitbrush. The production of air-dry vegetation is about 500 pounds per acre in normal years. It ranges from 300 pounds in unfavorable years to 700 pounds in favorable years.

If the quality of the vegetation on this unit deteriorates because of overgrazing, shrubs and unpalatable forbs increase in abundance. Under further deterioration, annual weeds invade the unit. Suitable management practices are deferred grazing, rotation grazing, and brush control.

This unit is not suited to cropland or homesites. Because of alkalinity and the clay subsoil, the Debone soil is unsuitable for cropping. Because of the hazard of rare flooding, the Clowers and Debone soils are unsuitable for use as homesites.

The Clowers soil is in capability subclass VIe, dryland; Loamy range site; and windbreak suitability group 1K. The Debone soil is in capability subclass VIIs, dryland; Saline Lowland, Drained, range site; and windbreak suitability group 9N. The Edlin soil is in capability subclass VIe, dryland; Sandy range site; and windbreak suitability group 6G.

53—Debone-Shellcreek Variant complex, 0 to 2 percent slopes. This map unit is on level and nearly level alluvial fans along the major streams. It is subject to rare flooding. The native vegetation is salt-tolerant shrubs, forbs, and grasses. Individual areas are irregular in shape and range from 10 to 200 acres in size. They are about 40 percent Debone clay loam and 40 percent Shellcreek Variant silty clay. The components of this unit occur as areas so intricately intermingled that mapping them separately was not practical.

Included with these soils in mapping are small areas of Debone Variant, Hooper, Mishak, Mishak Variant, and Quealman soils and Fluvaquents, all of which are on bottom land. Also included are bare areas where sand and gravel have been deposited along the streams. Included areas make up about 20 percent of the unit. The percentage varies from one area to another.

The Debone soil is very deep and is well drained or moderately well drained. Typically, the surface layer is light brownish gray clay loam about 2 inches thick. The subsoil is grayish brown clay about 11 inches thick. The substratum to a depth of 60 inches or more is light olive brown fine sandy loam. About 10 to 20 percent of the surface is covered with 4- to 8-inch coppice dunes of loamy fine sand held in place by shrubs.

Permeability is slow in the Debone soil. The available water capacity is 6 to 8 inches. The effective rooting depth is 60 inches or more. The hazards of water erosion and wind erosion are slight. This soil is sodic.

The Shellcreek Variant soil is very deep and moderately well drained. Typically, a thin white coating of salt is on the surface. The surface layer is brown silty clay about 2 inches thick. It is strongly saline and strongly alkaline. The subsoil is brown silty clay about 22 inches thick. The next layer is light brownish gray clay loam about 26 inches thick. Below this to a depth of 60 inches or more is light brownish gray loam.

Permeability is slow in the Shellcreek Variant soil. The available water capacity is 5 to 8 inches. The effective rooting depth is 60 inches or more. A water table is at a depth of 4 to 5 feet during spring runoff. Runoff is slow, and the hazard of water erosion is slight in all areas, except for those where streambank cutting has occurred. The hazard of wind erosion is moderate.

All of this unit is rangeland. It provides some food and cover for small mammals and birds.

The potential plant community on the Debone soil is mainly bottlebrush squirreltail, Indian ricegrass, western wheatgrass, basin wildrye, bud sagewort, and greasewood. The production of air-dry vegetation is about 700 pounds per acre in normal years. It ranges from 400 pounds in unfavorable years to 900 pounds in favorable years. The Shellcreek Variant soil generally supports no vegetation, except for some annual weeds.

If the quality of the vegetation on this unit deteriorates because of overgrazing, greasewood increases in abundance. Under further deterioration, halogeton invades the unit. Suitable management practices are deferred grazing and brush control. The main limitations affecting range seeding are the salinity and alkalinity and the low precipitation.

This unit is not suited to cropland or homesites. The main limitations affecting cropland are the salinity and alkalinity. The water table, the hazard of flooding, and a high shrink-swell potential are problems on homesites.

The capability subclass is VIIs, dryland; Saline Lowland, Drained, range site. The Debone soil is in windbreak suitability group 9N, and the Shellcreek Variant soil is in windbreak suitability group 10.

54—Debone Variant-Shellcreek Variant complex, 0 to 1 percent slopes. This map unit is on level valley floors. It is subject to rare flooding. The native vegetation is salt-tolerant shrubs, forbs, and grasses. Individual areas are irregular in shape and range from 500 to 600 acres in size. They are about 50 percent Debone Variant silty clay loam and 40 percent Shellcreek Variant silty clay. The components of this unit occur as areas so intricately intermingled that mapping them separately was not practical.

Included with these soils in mapping are small areas of Debone and Mishak soils on the valley floors. These soils make up about 10 percent of the unit. The percentage varies from one area to another.

The Debone Variant soil is very deep and moderately well drained. Typically, the surface layer is grayish brown silty clay loam about 1 inch thick. The subsoil is grayish brown silty clay about 3 inches thick. It is strongly alkaline. The substratum to a depth of 60 inches is grayish brown and light olive brown silty clay.

Permeability is slow in the Debone Variant soil. The available water capacity is 7 to 9 inches. The effective rooting depth is 60 inches or more. This soil receives runoff from adjacent areas and may be slightly ponded for brief periods. The hazards of water erosion and wind erosion are slight. The soil is strongly saline or very strongly saline.

The Shellcreek Variant soil is very deep and moderately well drained. Typically, a thin white coating of salt is on the surface. The surface layer is brown silty clay about 2 inches thick. It is strongly saline-alkaline. The subsoil is brown and yellowish brown silty clay about 22 inches thick. The next layer is light brownish gray clay loam about 26 inches thick. The substratum to a depth of 60 inches is light brownish gray loam.

Permeability is slow in the Shellcreek Variant soil. The available water capacity is 5 to 8 inches. The seasonal high water table is at a depth of 4 to 5 feet. The effective rooting depth is 60 inches or more. Runoff is very slow. This soil receives runoff from adjacent areas and is subject to rare ponding. The hazard of water erosion is slight. The hazard of wind erosion is moderate.

All of this unit is rangeland. It provides some food and cover for antelope, small mammals, and birds.

The potential plant community on this unit is mainly alkali sacaton, bottlebrush squirreltail, basin wildrye, Indian ricegrass, greasewood, and gardner saltbush. Most of the vegetation is on the Debone Variant soil. The Shellcreek Variant soil supports almost no vegetation. The production of air-dry vegetation is about 700 pounds per acre in normal years. It ranges from 400 pounds in unfavorable years to 900 pounds in favorable years.

If the quality of the vegetation on this unit deteriorates because of overgrazing, greasewood increases in abundance. Under further deterioration, halogeton and other weeds invade the unit. Suitable management practices are deferred grazing and brush control. The main limitations affecting range seeding are the salinity and alkalinity and the low precipitation.

This unit is not suited to cropland or homesites. The main limitations affecting irrigated cropland are the salinity and alkalinity and the slow permeability. A high shrink-swell potential and the hazard of rare flooding are problems on homesites.

The capability subclass is VIIs, dryland; Saline Lowland, Drained, range site. The Debone Variant soil is in windbreak suitability group 9N, and the Shellcreek Variant soil is in windbreak suitability group 10.

55—Diamondville-Forelle sandy loams, 0 to 3 percent slopes. These level and nearly level, well drained soils are on upland plains. The Diamondville soil is in level and nearly level areas. The Forelle soil is in slightly concave areas. The native vegetation is shrubs, forbs, and grasses. Individual areas are irregular in shape and range from 10 to 150 acres in size. They are about 50 percent Diamondville sandy loam and 30 percent Forelle sandy loam. The components of this unit occur as areas so intricately intermingled that mapping them separately was not practical.

Included with these soils in mapping are small areas of Elk Mountain and Worfman soils on upland plains. These soils make up about 20 percent of the unit. The percentage varies from one area to another.

The Diamondville soil is moderately deep and well drained. Typically, the surface layer is brown sandy loam about 3 inches thick. The upper part of the subsoil is brown clay loam about 8 inches thick. The lower part is light olive brown loam about 9 inches thick. The next layer is light olive gray loam about 16 inches thick. Shale bedrock is at a depth of about 36 inches.

Permeability is moderately slow in the Diamondville soil. The available water capacity is 5 to 6 inches. The effective rooting depth is 20 to 40 inches.

The Forelle soil is very deep and well drained. Typically, the surface layer is brown sandy loam about 3 inches thick. The upper part of the subsoil is yellowish brown loam about 8 inches thick. The lower part is pale brown loam about 11 inches thick. The substratum to a depth of 60 inches is light brownish gray and light yellowish brown sandy loam.

Permeability is moderate in the Forelle soil. The available water capacity is 7 to 8 inches. Generally, the effective rooting depth is 60 inches. In some areas, however, roots are restricted by bedrock at a depth of 40 to 60 inches.

Runoff is slow on this unit, and the hazard of water erosion is slight. The hazard of wind erosion is moderate.

About half of this unit is rangeland, and half is irrigated cropland. The unit provides food and cover for antelope, sage grouse, rabbits, other small mammals, and birds.

The potential plant community in the areas of rangeland is mainly thickspike wheatgrass, needleandthread, Indian ricegrass, big sagebrush, and low rabbitbrush. The production of air-dry vegetation is about 500 pounds per acre in normal years. It ranges from 300 pounds in unfavorable years to 700 pounds in favorable years.

If the quality of the vegetation on this unit deteriorates because of overgrazing, shrubs and forbs increase in abundance. Under further deterioration, annual weeds invade the unit. Suitable management practices are deferred grazing, rotation grazing, and brush control. The main limitation affecting range seeding is low precipitation.

In cropped areas contour ditch, border ditch, and sprinkler irrigation methods are used. Sprinkler irrigation is the most efficient method. Leaving crop residue on the surface helps to control wind erosion. Incorporating crop residue and other organic material into the soil improves tilth and increases the rate of water infiltration.

This unit is suited to homesites. The bedrock underlying the Diamondville soil is a problem on sites for septic tank absorption fields and for shallow excavations.

The capability subclass is VIe, dryland, and IVe, irrigated; Loamy range site; irrigation design group 10. The Diamondville soil is in windbreak suitability group 6R, and the Forelle soil is in windbreak suitability group 8.

56—Edlin fine sandy loam, 0 to 1 percent slopes. This level, very deep, well drained soil is on the valley floors and alluvial fans throughout the survey area. Individual areas are irregular in shape and range from 5 to 150 acres in size. The native vegetation is shrubs, forbs, and grasses.

Included with this soil in mapping are small areas of Farson and Forelle soils on the valley floors and alluvial fans. These soils make up about 10 percent of the unit. The percentage varies from one area to another.

Typically, the Edlin soil has a surface layer of light brownish gray fine sandy loam about 4 inches thick. The subsoil is brown sandy loam about 15 inches thick. The next layer is light gray sandy loam about 21 inches thick. The substratum to a depth of 60 inches is light yellowish brown sandy loam.

Permeability is moderately rapid. The available water capacity is 7 to 8 inches. The effective rooting depth is 60 inches or more. Runoff is very slow, and the hazard of water erosion is very slight. This soil is likely to receive deposits from adjacent areas. The hazard of wind erosion is moderate.

Almost all of this unit is irrigated cropland. Some small areas are used as rangeland. The unit provides habitat for wildlife.

The potential plant community in the areas of rangeland is mainly Indian ricegrass, needleandthread, needleleaf sedge, thickspike wheatgrass, big sagebrush, and low rabbitbrush. The production of air-dry vegetation is about 500 pounds per acre in normal years. It ranges from 300 pounds in unfavorable years to 700 pounds in favorable years. If the quality of the vegetation deteriorates because of overgrazing, shrubs and unpalatable forbs increase in abundance. Under further deterioration, annual weeds invade the unit. Suitable management practices are deferred grazing, rotation grazing, and brush control.

Border dike and sprinkler irrigation methods are suitable on this unit. The main limitations on irrigated cropland are the moderate hazard of wind erosion and the moderate available water capacity. Leaving crop residue on the surface helps to control wind erosion. Incorporating crop residue and other organic material into the soil improves tilth and increases the rate of water infiltration.

The capability subclass is VIs, dryland, and IVs, irrigated; Sandy range site; irrigation design group 15; windbreak suitability group 6G.

57—Edlin fine sandy loam, 1 to 6 percent slopes. This nearly level and gently sloping, very deep, well drained soil is on alluvial fans and toe slopes throughout the survey area. Individual areas are irregular in shape or elongated and range from 5 to 300 acres in size. The native vegetation is shrubs, forbs, and grasses.

Included with this soil in mapping are small areas of Sobson and Vonason soils on the alluvial fans and toe slopes. These soils make up about 15 percent of the unit. The percentage varies from one area to another.

Typically, the Edlin soil has a surface layer of brown fine sandy loam about 4 inches thick. The subsoil also is brown fine sandy loam. It is about 7 inches thick. The next layer is pale brown fine sandy loam about 19 inches thick. The substratum to a depth of 60 inches also is pale brown fine sandy loam.

Permeability is moderately rapid. The available water capacity is 7 to 8 inches. The effective rooting depth is 60 inches or more. Runoff is slow or medium, and the hazard of water erosion is slight or moderate. The hazard of wind erosion is moderate.

All of this unit is rangeland. It provides food and cover for antelope, deer, sage grouse, rabbits, other small mammals, and birds.

The potential plant community is mainly Indian ricegrass, needleandthread, needleleaf sedge, thickspike wheatgrass, big sagebrush, and low rabbitbrush. The production of air-dry vegetation is about 500 pounds per acre in normal years. It ranges from 300 pounds in unfavorable years to 700 pounds in favorable years. If the quality of the vegetation deteriorates because of overgrazing, shrubs and unpalatable forbs increase in abundance. Under further deterioration, annual weeds invade the unit. Suitable management practices are deferred grazing, rotation grazing, and brush control.

This unit is suitable for irrigated crops if irrigation water is available. Although a contour ditch system can be used, a sprinkler system is more efficient. Gullying, rill erosion, and wind erosion are hazards.

This unit is well suited to homesites.

The capability subclass is VIe, dryland, and IVe, irrigated; Sandy range site; irrigation design group 15; windbreak suitability group 6G.

58—Edlin-Cotopaxi complex, gently sloping and duned. This map unit is on alluvial fans and dunes along the eastern side of the survey area. The native vegetation is shrubs, forbs, and grasses. Individual areas are irregular in shape and range from 30 to 300 acres in size. They are about 60 percent Edlin fine sandy loam, 2 to 5 percent slopes, and 20 percent Cotopaxi fine sand, 3 to 20 percent slopes. The Edlin soil is in the gently sloping areas on alluvial fans. The Cotopaxi soil is on scattered dunes. The components of this unit occur as areas so intricately intermingled that mapping them separately was not practical.

Included with these soils in mapping are small areas of Sobson soils and a soil that is similar to the Edlin soil but has a texture of loam in which the content of clay is 15 to 25 percent. The included soils are on the alluvial fans. They make up about 20 percent of the unit. The percentages vary from one area to another.

The Edlin soil is very deep and well drained. Typically, the surface layer is grayish brown fine sandy loam about 2 inches thick. The subsoil is grayish brown fine sandy loam about 10 inches thick. The substratum to a depth of 60 inches is light olive brown fine sandy loam.

Permeability is moderately rapid in the Edlin soil. The available water capacity is 7 to 8 inches. The effective rooting depth is 60 inches or more. Runoff is slow or medium. The hazard of water erosion generally is slight or moderate. Gullying is severe, however, in drainage channels. The hazard of wind erosion is moderate.

The Cotopaxi soil is very deep and somewhat excessively drained. Typically, the surface layer is grayish brown fine sand about 24 inches thick. The substratum to a depth of 60 inches is grayish brown loamy fine sand.

Permeability is rapid in the Cotopaxi soil. The available water capacity is 2 to 4 inches. The effective rooting depth is 60 inches or more. Runoff is slow or medium, and the hazard of water erosion is slight or moderate. The hazard of wind erosion is severe.

All of this unit is rangeland. It provides food and cover for antelope, sage grouse, rabbits, other small mammals, and birds.

The potential plant community on the Edlin soil is mainly needleandthread, Indian ricegrass, needleleaf sedge, big sagebrush, and low rabbitbrush. The production of air-dry vegetation is about 500 pounds per acre in normal years. It ranges from 300 pounds in unfavorable years to 700 pounds in favorable years. If the quality of the vegetation deteriorates because of overgrazing, shrubs and unpalatable forbs increase in abundance. Under further deterioration, annual weeds invade the unit.

The potential plant community on the Cotopaxi soil is mainly needleandthread, Indian ricegrass, thickspike wheatgrass, bottlebrush squirreltail, spiny hopsage, and rubber rabbitbrush. The production of air-dry vegetation is about 500 pounds per acre in normal years. It ranges from 350 pounds in unfavorable years to 700 pounds in favorable years. If the quality of the vegetation deteriorates because of overgrazing, shrubs increase in abundance. Under further deterioration, annual weeds invade the unit.

Suitable management practices are deferred grazing, rotation grazing, and brush control. The main limitations affecting range seeding are the low precipitation and the duned topography.

The Edlin soil is in capability subclass VIe, dryland; Sandy range site. The Cotopaxi soil is in capability subclass VIIs, dryland; Sands range site. The Edlin soil is in windbreak suitability group 6G, and the Cotopaxi soil is in windbreak suitability group 7.

59—Edlin-Huguston complex, 6 to 30 percent slopes. This map unit is on ridges, scarps, and toe slopes throughout the survey area. Slopes range from 200 to 500 feet in length. The native vegetation is shrubs, forbs, and grasses. Individual areas are long and narrow and range from 10 to 100 acres in size. They are about 50 percent Edlin fine sandy loam, 6 to

20 percent slopes, and 30 percent Huguston sandy loam, 6 to 30 percent slopes. The Edlin soil is on the foot slopes, and the Huguston soil is on the shoulders of the ridges and on scarps. The components of this unit occur as areas so intricately intermingled that mapping them separately was not practical.

Included with these soils in mapping are small areas of Elk Mountain soils, the Haterton soils that have a thin solum, and Means soils. Elk Mountain soils are on side slopes. The Haterton soils that have a thin solum are on shoulder slopes. Means soils are on the tops or crests of the slopes. Included soils make up about 20 percent of the unit. The percentage varies from one area to another.

The Edlin soil is very deep and well drained. Typically, it has a surface layer of grayish brown fine sandy loam about 1 inch thick. The subsoil is light olive brown fine sandy loam about 9 inches thick. The next layer is light yellowish brown fine sandy loam about 15 inches thick. The substratum to a depth of 60 inches is light brownish gray sandy loam that has thin strata of channery sandy loam.

Permeability is moderately rapid in the Edlin soil. The available water capacity is 7 to 8 inches. The effective rooting depth is 60 inches or more. Runoff is medium or rapid, and the hazard of water erosion is moderate or severe. The hazard of wind erosion is moderate.

The Huguston soil is shallow and well drained. Typically, the surface layer is brown sandy loam about 5 inches thick. The next layer is pale brown sandy loam about 10 inches thick. Soft sandstone is at a depth of about 15 inches.

Permeability is moderately rapid above the bedrock in the Huguston soil. The available water capacity is 2 to 3 inches. The effective rooting depth is 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is severe. The hazard of wind erosion is moderate.

All of this unit is rangeland. It provides food and cover for antelope, deer, sage grouse, rabbits, other small mammals, and birds.

The potential plant community on the Edlin soil is mainly Indian ricegrass, needleandthread, needleleaf sedge, big sagebrush, and low rabbitbrush. The production of air-dry vegetation is about 500 pounds per acre in normal years. It ranges from 300 pounds in unfavorable years to 700 pounds in favorable years.

The potential plant community on the Huguston soil is mainly galleta, Indian ricegrass, needleandthread, thickspike wheatgrass, big sagebrush, and low rabbitbrush. The production of air-dry vegetation is about 350 pounds per acre in normal years. It ranges from 200 pounds in unfavorable years to 450 pounds in favorable years.

If the quality of the vegetation on this unit deteriorates because of overgrazing, grasses decrease in abundance and shrubs and unpalatable forbs increase. Under further deterioration, annual weeds invade the unit. Suitable management practices are deferred grazing and rotation grazing.

Because of the slope and the shallowness to bedrock, this unit is not suited to cropland or to homesites.

The Edlin soil is in capability subclass VIe; Sandy range site. The Huguston soil is in capability subclass VIIe; Shallow Sandy range site. The Edlin soil is in windbreak suitability group 6G, and the Huguston soil is in windbreak suitability group 10.

60—Elk Mountain sandy loam, 0 to 1 percent slopes. This level, moderately deep, well drained soil is on valley floors throughout the survey area. Individual areas are irregular in shape and range from 20 to 100 acres in size. The native vegetation is shrubs, forbs, and grasses.

Included with this soil in mapping are small areas of Diamondville and Forelle soils on the valley floors. These soils make up about 15 percent of the unit. The percentage varies from one area to another.

Typically, the Elk Mountain soil has a surface layer of grayish brown sandy loam about 3 inches thick. The upper part of the subsoil is brown loam about 8 inches thick. The next part is light olive brown gravelly sandy loam about 13 inches thick. The lower part is calcareous, light olive brown gravelly sandy loam about 6 inches thick. The substratum is pale olive channery loam about 5 inches thick. Soft shale is at a depth of about 35 inches.

Permeability is moderately rapid above the bedrock. The available water capacity is 3 to 4 inches. The effective rooting depth and the depth to bedrock range from 20 to 40 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of wind erosion is moderate.

About half of this unit is rangeland, and half is irrigated cropland. The unit provides food and cover for antelope, sage grouse, rabbits, other small mammals, and birds.

The potential plant community in the areas of rangeland is mainly needleandthread, Indian ricegrass, thickspike wheatgrass, needleleaf sedge, big sagebrush, and low rabbitbrush. The production of air-dry vegetation is about 500 pounds per acre in normal years. It ranges from 300 pounds in unfavorable years to 700 pounds in favorable years. If the quality of the vegetation deteriorates because of overgrazing, shrubs and unpalatable forbs increase in abundance. Under further deterioration, annual weeds invade the unit. Suitable management practices are deferred grazing, rotation grazing, and brush control.

In the areas of irrigated cropland, the main limitations are the moderate hazard of wind erosion and the low available water capacity. Also, saline seeps may develop because of the perched water table above the bedrock. Border dike and sprinkler irrigation methods can be used. Sprinkler irrigation is the most efficient method. Leaving crop residue on the surface helps to control wind erosion. Incorporating crop residue and other organic material into the soil improves tilth and increases the rate of water infiltration.

This unit can be used for homesites. The main limitation affecting homesite development and shallow excavations is the moderate depth to bedrock. Special design is needed on sites for septic tank absorption fields.

The capability subclass is VIs, dryland, and IVs, irrigated; Sandy range site; irrigation design group 14; windbreak suitability group 6R.

61—Elk Mountain sandy loam, 1 to 6 percent slopes. This gently sloping, moderately deep, well drained soil is on valley floors throughout the survey area. Individual areas are irregular in shape and range from 5 to 100 acres in size. The native vegetation is shrubs, forbs, and grasses.

Included with this soil in mapping are small areas of Diamondville and Forelle soils on the valley floors. These soils make up about 15 percent of the unit. The percentage varies from one area to another.

Typically, the Elk Mountain soil has a surface layer of grayish brown sandy loam about 3 inches thick. The upper part of the subsoil is brown loam about 8 inches thick. The next part is light olive brown gravelly sandy loam about 13 inches thick. The lower part is calcareous, light olive brown gravelly sandy loam about 6 inches thick. Soft shale bedrock is at a depth of about 35 inches.

Permeability is moderately rapid above the bedrock. The available water capacity is 3 to 4 inches. The effective rooting depth is 20 to 40 inches. Runoff is slow or medium, and the hazard of water erosion is slight or moderate. The hazard of wind erosion is moderate.

About half of this unit is rangeland, and half is irrigated cropland. The unit provides food and cover for antelope, sage grouse, rabbits, other small mammals, and birds.

The potential plant community in the areas of rangeland is mainly needleandthread, Indian ricegrass, thickspike wheatgrass, needleleaf sedge, big sagebrush, and low rabbitbrush. The production of air-dry vegetation is about 500 pounds per acre in normal years. It ranges from 300 pounds in unfavorable years to 700 pounds in favorable years. If the quality of the vegetation deteriorates because of overgrazing, shrubs and unpalatable forbs increase in abundance. Under further deterioration, annual weeds invade the unit. Suitable management practices are deferred grazing, rotation grazing, and brush control.

In the areas used as irrigated cropland, the main limitations are gullying and rill erosion, the moderate hazard of wind erosion, and the low available water capacity. Also, saline seeps may develop because of the perched water table above the shale bedrock. Contour ditch and sprinkler irrigation methods can be used. Sprinkler irrigation is the most efficient method. Leaving crop residue on the surface helps to control wind erosion. Incorporating crop residue or other organic material into the soil improves tilth and increases the rate of water infiltration.

This unit can be used for homesites. The main limitation affecting homesite development and shallow excavations is the moderate depth to bedrock. Special design is needed on sites for septic tank absorption fields.

The capability subclass is VIe, dryland, and IVe, irrigated; Sandy range site; irrigation design group 14; windbreak suitability group 6R.

62—Farson sandy loam, 0 to 1 percent slopes. This level, very deep, well drained soil is on valley floors throughout the survey area. Individual areas are irregular in shape and range from 100 to 1,000 acres in size. The native vegetation is shrubs, forbs, and grasses.

Included with this soil in mapping are small areas of Bosler, Means, and Vonason soils on the valley floors. These soils make up about 10 percent of the unit. The percentage varies from one area to another.

Typically, the Farson soil has a surface layer of brown sandy loam about 8 inches thick. The subsoil also is brown sandy loam. It is about 9 inches thick. The next layer is pale brown gravelly sandy loam about 2 inches thick. The substratum to a depth of 60 inches is light brownish gray gravelly sand and coarse sand. Where land leveling has occurred, the surface layer and, in places, the subsoil have been removed.

Permeability is moderately rapid. The available water capacity is 3 to 5 inches. The effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of wind erosion is moderate.

Almost all of this unit is irrigated cropland. This is the main irrigated soil in the survey area. A few small areas are used as rangeland. The town of Farson is located on this unit as are numerous homesites. The unit provides food and cover for antelope, deer, rabbits, other small mammals, and birds.

The potential plant community in the areas of rangeland is mainly thickspike wheatgrass, Indian ricegrass, needleandthread, needleleaf sedge, big sagebrush, and rubber rabbitbrush. The production of air-dry vegetation is about 500 pounds per acre in normal years. It ranges from 300 pounds in unfavorable years to 700 pounds in favorable years. If the quality of the vegetation deteriorates because of overgrazing, shrubs and unpalatable forbs increase in abundance. Under further deterioration, annual weeds invade the unit. Suitable management practices are deferred grazing, rotation grazing, and brush control. The main limitation affecting range seeding is low precipitation.

Border dike, border ditch, and sprinkler irrigation methods are used on this unit. Sprinkler irrigation is the most efficient method. Because of the low available water capacity, frequently applying about 3 inches of water is the best means of irrigating. Much water is lost through deep percolation into the coarse textured substratum. Leaving crop residue on the surface helps to control wind erosion. Incorporating crop residue or other organic material into the soil improves tilth and increases the rate of water infiltration.

This unit is well suited to homesites. Septic tank absorption fields function well, but the effluent can pollute ground water because of the highly porous substratum. The sides of shallow excavations are likely to cave in.

The capability subclass is VIs, dryland, and IVs, irrigated; Sandy range site; irrigation design group 13; windbreak suitability group 6G.

63—Farson sandy loam, 1 to 3 percent slopes. This nearly level, very deep, well drained soil is on valley floors throughout the survey area. Individual areas are irregular in shape and range from 20 to 1,000 acres in size. The native vegetation is shrubs, forbs, and grasses.

Included with this soil in mapping are small areas of Bosler, Means, and Vonason soils on the valley floors. Bosler soils are generally along the Big Sandy River in the northern part of the survey area. Included soils make up about 15 percent of the unit. The percentage varies from one area to another.

Typically, the Farson soil has a surface layer of grayish brown sandy loam about 8 inches thick. The subsoil is brown sandy loam about 9 inches thick. The next layer is pale brown gravelly sandy loam about 2 inches thick. The substratum to a depth of 60 inches is light brownish gray gravelly sand and coarse sand. Where land leveling has occurred, the surface layer and, in places, the subsoil have been removed.

Permeability is moderately rapid. The available water capacity is 3 to 5 inches. The effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of wind erosion is moderate.

Most of this unit is rangeland. Some areas are used as irrigated cropland. The unit provides food and cover for antelope, deer, sage grouse, rabbits, other small mammals, and birds.

The potential plant community in the areas of rangeland is mainly thickspike wheatgrass, Indian ricegrass, needleandthread, needleleaf sedge, big sagebrush, and rubber rabbitbrush. The production of air-dry vegetation is about 500 pounds per acre in normal years. It ranges from 300 pounds in unfavorable years to 700 pounds in favorable years. If the quality of the vegetation deteriorates because of overgrazing, shrubs and unpalatable forbs increase in abundance. Under further deterioration, annual weeds invade the unit. Suitable management practices are deferred grazing, rotation grazing, and brush control. The main limitation affecting range seeding is low precipitation.

Border ditch, contour ditch, and sprinkler irrigation methods are used on this unit. Sprinkler irrigation is the most efficient method. Because of the low available water capacity, frequently applying about 3 inches of water is the best means of irrigating. Much water is lost through deep percolation into the coarse textured substratum. Leaving crop residue on the surface helps to control wind erosion. Incorporating this residue or other organic material into the soil improves tilth and increases the rate of water infiltration.

This unit is well suited to homesites. Septic tank absorption fields function well, but the effluent can pollute ground water because of the highly porous substratum. The sides of shallow excavations are likely to cave in.

The capability subclass is VIs, dryland, and IVs, irrigated; Sandy range site; irrigation design group 13; windbreak suitability group 6G.

64—Farson sandy loam, wet, 0 to 1 percent slopes. This level, very deep, moderately well drained soil is on valley floors throughout the survey area. Individual areas are irregular in shape and range from 10 to 1,500 acres in size.

Included with this soil in mapping are small areas of Littlebear, Means, and Vonason soils on the valley floors. These soils make up about 10 percent of the unit. The percentage varies from one area to another.

Typically, the Farson soil has a surface layer of grayish brown sandy loam about 6 inches thick. The subsoil is brown sandy loam about 8 inches thick. The next layer is pale brown loamy coarse sand about 6 inches thick. The substratum to a depth of 60 inches is light olive gray coarse sand. Where land leveling has occurred, the surface layer and, in places, the subsoil have been removed.

Permeability is moderately rapid. The available water capacity is 3 to 5 inches. The water table is at a depth of 3 to 4 feet during the irrigation season. The effective rooting depth is 60 inches or more. The surface layer commonly is slightly saline. A few areas are moderately saline. Runoff is very slow, and the hazard of water erosion is slight. The hazard of wind erosion also is slight because the surface layer is moist most of the time.

All of this unit is irrigated cropland. It provides some food and cover for antelope, deer, rabbits, other small mammals, and birds.

Border dike, border ditch, and sprinkler irrigation methods are used on this unit. Sprinkler irrigation is the most efficient method. Frequently applying about 3 inches of water is the best means of irrigating. Much water is lost through deep percolation into the coarse textured substratum. Leaving crop residue on the surface helps to control wind erosion. Incorporating crop residue or other organic material into the soil improves tilth and increases the rate of water infiltration.

This unit is not well suited to homesites. Because of the wetness, septic tank absorption fields require special design. The effluent can pollute ground water because of the highly porous substratum. The sides of shallow excavations are likely to cave in.

The capability subclass is IVw, irrigated; irrigation design group 13; and windbreak suitability group 6G.

65—Farson-Means sandy loams, 3 to 10 percent slopes. This map unit is on gently sloping and moderately sloping valley floors in the northern part of the survey area. Slopes are 150 to 300 feet long. The native vegetation is shrubs, forbs, and grasses. Individual areas are long and narrow and range from 10 to 50 acres in size. They are about 60 percent Farson sandy loam and 30 percent Means sandy loam. The components of this unit occur as areas so intricately intermingled that mapping them separately was not practical.

Included with these soils in mapping are small areas of Edlin, Elk Mountain, and Vonason soils on the valley floors. These included soils make up about 10 percent of the unit. The percentage varies from one area to another.

The Farson soil is very deep and well drained. Typically, the surface layer is light brownish gray sandy loam about 5 inches thick. The subsoil is brown sandy loam about 8 inches thick. The substratum to a depth of 60 inches is brown and pale brown, stratified loamy sand and sand.

Permeability is moderately rapid in the Farson soil. The available water capacity is 3 to 5 inches. The effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate. The hazard of wind erosion also is moderate.

The Means soil is moderately deep and well drained. Typically, the surface layer is grayish brown sandy loam about 3 inches thick. The subsoil is brown sandy loam about 13 inches thick. The next layer is brown and light olive brown loamy sand about 21 inches thick. Shale is at a depth of about 37 inches.

Permeability is moderate in the Means soil. The available water capacity is 3 to 4 inches. The effective rooting depth is 24 to 40 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of wind erosion also is moderate.

Almost all of this unit is rangeland. Two small areas are cropped along with the surrounding irrigated cropland. The unit provides food and cover for antelope, deer, sage grouse, rabbits, other small mammals, and birds.

The potential plant community in the areas used as rangeland is mainly needleandthread, thickspike wheatgrass, Indian ricegrass, needleleaf sedge, big sagebrush, and rubber rabbitbrush. The production of air-dry vegetation is about 500 pounds per acre in normal years. It ranges from 300 pounds in unfavorable years to 700 pounds in favorable years. If the quality of the vegetation deteriorates because of overgrazing, shrubs and unpalatable forbs increase in abundance. Under further deterioration, annual weeds invade the unit. Suitable management practices are deferred grazing, rotation grazing, and brush control. The main limitation affecting range seeding is low precipitation.

The small areas of cropland are managed together with the surrounding areas. These areas can be properly irrigated only by a sprinkler system.

This unit is suited to homesites. The moderate depth to bedrock in the Means soil interferes with the operation and construction of septic tank absorption fields and is a limitation in shallow excavations. Because of coarse textures, the soils do not adequately filter the effluent in septic tank absorption fields. As a result, the effluent can pollute ground water. The sides of shallow excavations can cave in because of the coarse textures.

The capability subclass is VIe, dryland, and IVe, irrigated; Sandy range site; irrigation design group 13; windbreak suitability group 6G.

66—Farson Variant gravelly sandy loam, 0 to 1 percent slopes. This level, very deep, somewhat poorly drained soil is on valley floors throughout the survey area. Individual areas are irregular in shape and range from 10 to 300 acres in size. The native vegetation is shrubs, grasses, and sedges.

Included with this soil in mapping are small areas of Gunbarrel and Littlebear soils on the valley floors. These soils make up about 15 percent of the unit. The percentage varies from one area to another.

Typically, the Farson Variant soil has a surface layer of brown gravelly sandy loam about 7 inches thick. The subsoil also is brown gravelly sandy loam. It is about 11 inches thick. The substratum to a depth of 60 inches is pale brown, light yellowish brown, and light gray, stratified coarse sand, gravelly sand, and gravelly loamy sand.

Permeability is moderately rapid. The available water capacity is 2 to 4 inches. The water table is at a depth of 3 to 5 feet during the irrigation season. The effective rooting depth is 60 inches or more. Runoff is very slow, and the hazard of water erosion is slight. The hazard of wind erosion also is slight. The soil is strongly saline-sodic in the surface layer and moderately or slightly saline-sodic in the substratum.

Nearly all of this unit has been irrigated cropland at one time. Some areas are still cropped and some are pastured or are idle. The unit provides some food and cover for small mammals and birds.

Drainage measures that lower the water table and leach the salts from the soil can improve productivity on this unit. A sprinkler irrigation system should be used on this soil and the surrounding soils. The amount of water that is applied to the surface should be limited because of the seasonal high water table. Salt-tolerant forage grasses, such as tall wheatgrass, crested wheatgrass, and tall fescue, should be selected for planting.

This unit is not suitable as a site for homes. The main limitations are the high water table and the saline-alkali condition. Also, the sides of shallow excavations may cave in.

The capability subclass is VIs; irrigation design group 13; windbreak suitability group 1K.

67—Fluvaquents, 0 to 3 percent slopes. These deep and moderately deep, poorly drained soils are in depressions, swales, and drainage channels throughout the survey area. Individual areas are long and narrow and range from 5 to 40 acres in size. The native vegetation is grasses and sedges.

These soils are dominantly clay loam, loam, or sandy loam. Some have a gravelly sandy loam substratum below a depth of 20 inches. Others have shale bedrock at a depth of 20 to 60 inches. Some of these soils are slightly saline or moderately saline in the surface layer.

Permeability is moderate or moderately rapid. The available water capacity is 3 to 12 inches. Capillary water is supplied by a water table, which is at a depth of 1 to 3 feet during most spring and summer months. The effective rooting depth is 20 to 60 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of wind erosion also is slight.

All of this unit is used for pasture. It provides habitat for some birds and small mammals.

The potential plant community is mainly basin wildrye, Nebraska sedge, tufted hairgrass, western wheatgrass, and rubber rabbitbrush. The production of air-dry vegetation is about 3,000 pounds per acre in normal years. It ranges from 2,300 pounds in unfavorable years to 3,500 pounds in favorable years. If the quality of the vegetation deteriorates because of overgrazing, low-growing sedges and rushes increase in abundance. Under further deterioration, foxtail and other annual weeds invade the unit. Suitable management practices are deferring grazing, leveling hummocks, and seeding preferred species.

This unit is not suitable for cropland or homesites.

The capability subclass is Vw, dryland; Subirrigated range site; windbreak suitability group 1K.

68—Forelle sandy loam, 0 to 1 percent slopes. This level, very deep, well drained soil is on alluvial fans and in depressions in the north and south ends of the survey area. Individual areas are irregular in shape and range from 20 to 100 acres in size. The native vegetation is shrubs, forbs, and grasses.

Included with this soil in mapping are small areas of Edlin and Diamondville soils on alluvial fans. These soils make up about 5 percent of the unit. The percentage varies from one area to another.

Typically, the Forelle soil has a surface layer of pale brown sandy loam about 3 inches thick. The subsoil is brown clay loam about 15 inches thick. The substratum to a depth of 60 inches or more is pale brown sandy loam.

Permeability is moderate. The available water capacity is 7 to 9 inches. The effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of wind erosion also is slight.

Most of this unit is irrigated cropland. A small acreage is rangeland. The unit provides food and cover for antelope, deer, sage grouse, rabbits, other small mammals, and birds.

The potential plant community in the areas of rangeland is mainly thickspike wheatgrass, needleandthread, Indian ricegrass, bluebunch wheatgrass, big sagebrush, and low rabbitbrush. The production of air-dry vegetation is about 500 pounds per acre in normal years. It ranges from 300 pounds in unfavorable years to 500 pounds in favorable years. If the quality of the vegetation deteriorates because of overgrazing, shrubs and unpalatable forbs increase in abundance. Under further deterioration, annual weeds invade the unit. Suitable management practices are deferred grazing, rotation grazing, and brush control. The main limitation affecting range seeding is low precipitation.

This unit is well suited to irrigated cropland. Border dike and sprinkler irrigation methods are suitable. Sprinkler irrigation is the most efficient method. Incorporating crop residue and other organic material into the soil improves tilth and increases the rate of water infiltration.

This unit is suitable for homesites. The restricted permeability is a moderate limitation on sites for septic tank absorption fields.

The capability subclass is VIc, dryland, and IVc, irrigated; Loamy range site; irrigation design group 12; windbreak suitability group 8.

69—Forelle-Diamondville sandy loams, 3 to 6 percent slopes. This map unit is on gently sloping uplands throughout the survey area. The native vegetation is shrubs, forbs, and grasses. Individual areas are irregular in shape and range from 10 to 80 acres in size. They are about 50 percent Forelle sandy loam and 40 percent Diamondville sandy loam. The components of this unit occur as areas so intricately intermingled that mapping them separately was not practical.

Included with these soils in mapping are small areas of Elk Mountain and Worfman soils in the uplands. These included soils make up about 10 percent of the unit. The percentage varies from one area to another.

The Forelle soil is very deep and well drained. Typically, the surface layer is brown sandy loam about 3 inches thick. The upper part of the subsoil is yellowish brown loam about 8 inches thick. The lower part is pale brown loam about 11 inches thick. The substratum to a depth of 60 inches is variegated light yellowish brown and grayish brown sandy loam.

Permeability is moderate in the Forelle soil. The available water capacity is 7 to 9 inches. The effective rooting depth is generally 60 inches. In some areas, however, it is restricted by bedrock at a depth of 40 to 60 inches.

The Diamondville soil is moderately deep and well drained. Typically, the surface layer is grayish brown sandy loam about 3 inches thick. The upper part of the subsoil is brown clay loam about 8 inches thick. The lower part is light olive brown loam about 9 inches thick. The next layer is light olive gray clay loam about 16 inches thick. Shale is at a depth of about 36 inches.

Permeability is moderately slow in the Diamondville soil. The available water capacity is 5 to 6 inches. The effective rooting depth is 20 to 40 inches.

Runoff on this unit is medium, and the hazard of water erosion is moderate. The hazard of wind erosion also is moderate.

All of this unit is rangeland. It provides food and cover for antelope, sage grouse, rabbits, other small mammals, and birds.

The potential plant community is mainly thickspike wheatgrass, needleandthread, Indian ricegrass, big sagebrush, and low rabbitbrush. The production of air-dry vegetation is about 500 pounds per acre in normal years. It ranges from 300 pounds in unfavorable years to 700 pounds in favorable years.

If the quality of the vegetation on this unit deteriorates because of overgrazing, shrubs and forbs increase in abundance. Under further deterioration, annual weeds invade the unit. Suitable management practices are deferred grazing, rotation grazing, and brush control. The main limitation affecting range seeding is low precipitation.

If this unit is cropped, contour ditch and sprinkler irrigation methods are suitable. Sprinkler irrigation is the most efficient method. Leaving crop residue on the surface helps to control wind erosion. Incorporating crop residue and other organic material into the soil improves tilth and increases the rate of water infiltration.

This unit is suited to homesites. The moderate depth to bedrock in the Diamondville soil interferes with the operation and construction of septic tank absorption fields and is a limitation in shallow excavations.

The capability subclass is VIe, dryland, and IVe, irrigated; Loamy range site; irrigation design group 10. The Forelle soil is in windbreak suitability group 8, and the Diamondville soil is in windbreak suitability group 6R.

70—Gunbarrel loamy sand, 0 to 1 percent slopes. This level, very deep, somewhat poorly drained soil is in slight depressions on the valley floors in the southern part of the survey area. Individual areas are irregular in shape and range from 5 to 250 acres in size. The native vegetation is grasses and sedges.

Included with this soil in mapping are small areas of Littlebear soils and Fluvaquents. These soils are in depressions on the valley floors. They make up about 15 percent of the unit. The percentage varies from one area to another.

Typically, the Gunbarrel soil has a surface layer of light brownish gray loamy sand about 2 inches thick. The upper part of the substratum is grayish brown loamy sand about 14 inches thick. The lower part to a depth of 60 inches is light gray loamy sand.

Permeability is rapid. The available water capacity is 4 to 5 inches. The water table is at a depth of 1 to 2 feet during the irrigation season. The effective rooting depth is 60 inches or more. This soil receives seepage from surrounding irrigated areas. It also receives surface runoff from adjacent areas. The hazards of water erosion and wind erosion are slight. The soil is strongly saline-sodic in the surface layer and moderately or slightly saline-sodic in the substratum.

This unit is used for grazing. It provides habitat for some wildlife, mainly birds.

The potential plant community is mainly alkali sacaton, basin wildrye, inland saltgrass, Nuttall alkaligrass, and greasewood. The production of air-dry vegetation is about 2,500 pounds per acre in normal years. It ranges from 2,000 pounds in unfavorable years to 2,800 pounds in favorable years. If the quality of the vegetation deteriorates because of overgrazing, inland saltgrass and greasewood increase in abundance. Under further deterioration, annual weeds invade the unit. Suitable management practices are deferred grazing and rotation grazing.

This unit is not suitable for irrigated cropland or homesites because of the salinity and sodicity and the water table.

The capability subclass is Vs, dryland; Saline Subirrigated range site; windbreak suitability group 1K.

71—Haterton loam, 1 to 10 percent slopes. This gently sloping to sloping, shallow, well drained soil is on knolls and scarps along draws throughout the survey area. Individual areas generally are irregular in shape, but some of those along draws are long and narrow. Slopes are 300 to 400 feet long. The areas range from 5 to 60 acres in size.

Included with this soil in mapping are small areas of Diamondville soils and the Haterton soils that have a thin solum. The included soils are on the knolls and scarps. They make up about 15 percent of the unit. The percentage varies from one area to another.

Typically, this Haterton soil has a surface layer of light gray loam about 2 inches thick. The upper part of the substratum is pale brown loam about 9 inches thick. The lower part is very pale brown loam about 6 inches thick. Soft shale bedrock is at a depth of about 17 inches.

Permeability is moderate above the bedrock. The available water capacity is 2 to 3 inches. The effective rooting depth is 10 to 20 inches. Runoff is slow or medium, and the hazard of water erosion is slight or moderate. The hazard of wind erosion is moderate.

Most of this unit is rangeland. Some small areas are cropped along with the surrounding irrigated cropland. The unit provides some food and cover for antelope, deer, other small mammals, and birds.

The potential plant community in the areas of rangeland is mainly thickspike wheatgrass, bluebunch wheatgrass, Indian ricegrass, Sandberg bluegrass, big sagebrush, and black sagebrush. The production of air-dry vegetation is about 350 pounds per acre in normal years. It ranges from 200 pounds in unfavorable years to 450 pounds in favorable years. If the quality of the vegetation deteriorates because of overgrazing, the grasses decrease in abundance and the shrubs increase. Under further deterioration, annual weeds invade the unit. Suitable management practices are deferred grazing, rotation grazing, and brush control.

The areas used as irrigated cropland generally have been leveled. As a result shale fragments have been incorporated into the plow layer. The main limitations are low fertility and the shallowness to bedrock, which results in a low available water capacity. Also, water erosion is a hazard because little water is absorbed before it runs off the surface of the soil. Incorporating crop residue and other organic material into the soil improves tilth and fertility and increases the rate of water infiltration. Yields are significantly lower than those on the deeper surrounding soils.

This unit can be used for homesites. The

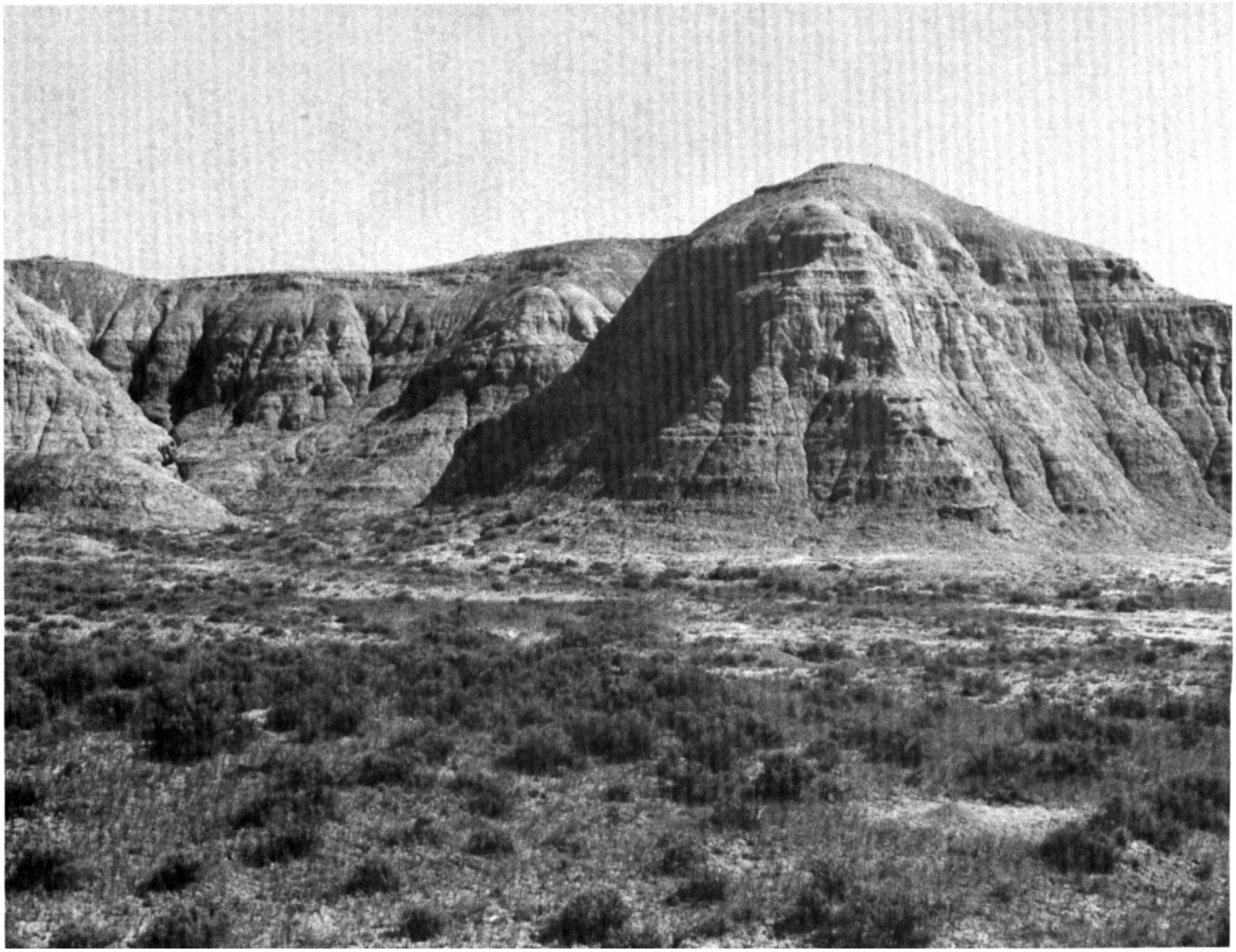

Figure 2.—An area of Haterton, thin solum-Haterton complex, 10 to 30 percent slopes. Edlin fine sandy loam, 1 to 6 percent slopes, is in the foreground.

shallowness to bedrock is a severe limitation on sites for septic tank absorption fields and in shallow excavations.

The capability subclass is VIIe; Shallow Loamy range site; windbreak suitability group 10.

72—Haterton, thin solum-Haterton complex, 10 to 30 percent slopes. This map unit is on scarps along the rivers, creeks, and washes and in the erosional uplands on the eastern side of the survey area (fig. 2). The native vegetation is shrubs, forbs, and grasses. Individual areas generally are irregular in shape but are long and narrow along streambanks. They range from 10 to 100 acres in size. They are about 50 percent Haterton channery loam that has a thin solum and 30 percent Haterton loam that has a thicker solum. The components of this unit occur as areas so intricately intermingled that mapping them separately was not practical.

Included with these soils in mapping are small areas of Diamondville, Edlin, and Huguston soils and rock outcrop. Diamondville soils are on slight benches and in swales. Edlin soils are on foot slopes. Huguston soils are intermingled with areas of both Haterton soils. The rock outcrop occurs as vertical cliffs along the Big Sandy River and on the sides of buttes and as bare areas of rock on steep shoulder slopes and on ridges and scarps in the erosional uplands. Included areas make up about 20 percent of the unit. The percentage varies from one area to another.

The Haterton soil that has a thin solum is very shallow and excessively drained. Typically, it is pale brown channery loam about 7 inches deep over shale. Permeability is moderate. The available water capacity is about 1 inch. The effective rooting depth is 4 to 10 inches. Runoff is rapid, and the hazard of water erosion is severe. The hazard of wind erosion is moderate.

The Haterton soil that has a thicker solum is shallow and well drained. Typically, the surface layer is brown loam about 6 inches thick. The substratum is very pale brown channery loam about 10 inches thick. Shale is at a depth of about 16 inches. Permeability is moderate. The available water capacity is 2 to 3 inches. The effective rooting depth is 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is severe. The hazard of wind erosion is moderate.

All of this unit is rangeland. It provides food and cover for antelope and deer and nesting sites for raptors and swallows.

The potential plant community on the Haterton soil that has a thin solum is mainly gardner saltbush, thickspike wheatgrass, bottlebrush squirreltail, Indian ricegrass, birdfoot sagebrush, and winterfat. The production of air-dry vegetation is about 250 pounds per acre in normal years. It ranges from 150 pounds in unfavorable years to 350 pounds in favorable years.

The potential plant community on the Haterton soil that has a thicker solum is mainly bluebunch wheatgrass, Indian ricegrass, Sandberg bluegrass, thickspike wheatgrass, and big sagebrush. The production of air-dry vegetation is about 350 pounds per acre in normal years. It ranges from 200 pounds in unfavorable years to 450 pounds in favorable years.

If the quality of the vegetation on this unit deteriorates because of overgrazing, shrubs and unpalatable forbs increase in abundance. Under further deterioration, annual weeds invade the unit. Suitable management practices are deferred grazing and rotation grazing. The main limitations affecting range seeding are the low precipitation and the slope.

This unit is not suitable for cropland or homesites because of the slope and the shallowness to bedrock.

The Haterton soil that has a thin solum is in capability subclass VIIs, dryland; Shale range site. The other Haterton soil is in capability subclass VIIe, dryland; Shallow Loamy range site. Both soils are in windbreak suitability group 10.

73—Hooper-Hooper, overblown, complex, 0 to 1 percent slopes. This map unit is in level areas on valley floors. The native vegetation is salt-tolerant shrubs, forbs, and grasses. Areas range from 10 to 400 acres in size. They are about 45 percent Hooper clay loam and 40 percent Hooper loamy fine sand. The components of this unit occur as areas so intricately intermingled that mapping them separately was not practical.

Included with these soils in mapping are small areas of Gunbarrel soils on the valley floors and small areas of Kandaly soils, which occur as dunes 3 to 4 feet high. Included soils make up about 15 percent of the unit. The percentage varies from one area to another.

Hooper clay loam is very deep and moderately well drained. Typically, the surface layer is light brownish gray clay loam about 2 inches thick. The subsoil is about 16 inches of very strongly alkaline, brown and pale brown clay and clay loam. The next layer is brown sandy clay loam about 10 inches thick. The substratum to a depth of 60 inches is light brownish gray gravelly sand. Permeability is very slow. The available water capacity is 2 to 3 inches. The effective rooting depth is 60 inches or more. Runoff is very slow, and the hazard of water erosion is slight. The hazard of wind erosion is moderate.

The overblown Hooper soil is very deep and moderately well drained. Typically, the surface layer is light brownish gray loamy fine sand about 9 inches thick. The subsoil is very strongly alkaline, brown clay loam about 11 inches thick. The next layer is pinkish gray sandy loam about 19 inches thick. The substratum to a depth of 60 inches is light brownish gray sand. Permeability is very slow. The available water capacity is 2 to 4 inches. The effective rooting depth is 60 inches or more. Runoff is very slow, and the hazard of water erosion is slight. The hazard of wind erosion is severe.

This unit has a water table at a depth of about 4 to 6 feet during the irrigation season.

All of this unit is rangeland. It provides food and cover for antelope, small mammals, and birds.

The potential plant community is mainly western wheatgrass, alkali sacaton, bottlebrush squirreltail, basin wildrye, and greasewood. The production of air-dry vegetation is about 1,200 pounds per acre in normal years. It ranges from 800 pounds in unfavorable years to 1,600 pounds in favorable years. If the quality of the vegetation deteriorates, greasewood increases in abundance. Under further deterioration, cheatgrass, dock, and pepperweed invade. Suitable management practices are deferred grazing, rotation grazing, and brush control.

This unit is not well suited to homesites. The main limitations are the water table and the sodic-saline condition.

The capability subclass is VIIs dryland, VIs irrigated; Saline Lowland range site; irrigation design group 5; windbreak suitability group 9N.

74—Kandaly fine sand, 3 to 20 percent slopes. This duned, very deep, somewhat excessively drained soil occurs as one irregularly shaped area on the southeast edge of the survey area. It is part of a larger duned area outside the survey area. The native vegetation is shrubs and grasses.

Included with this soil in mapping are small areas of Gunbarrel and Littlebear soils in small depressions. These soils make up about 5 percent of the unit. The percentage varies from one area to another.

Typically, the Kandaly soil has a surface layer of pale brown fine sand about 22 inches thick. The substratum to a depth of 60 inches is very pale brown fine sand.

Permeability is rapid. The available water capacity is 3 to 4 inches. The effective rooting depth is 60 inches or more. Runoff is slow because of a high rate of water infiltration. The hazard of water erosion is slight. The hazard of wind erosion is severe.

All of this unit is rangeland. It provides food and cover for antelope, deer, sage grouse, rabbits, other small mammals, and birds.

The potential plant community on this soil is mainly needleandthread, Indian ricegrass, thickspike wheatgrass, bottlebrush squirreltail, spiny hopsage, and rubber rabbitbrush. The production of air-dry vegetation is about 500 pounds per acre in normal years. It ranges from 350 pounds in unfavorable years to 700 pounds in favorable years. If the quality of the vegetation deteriorates because of overgrazing, shrubs increase in abundance. Under further deterioration, annual weeds invade the unit. Suitable management practices are deferred grazing and rotation grazing. The main limitations affecting range seeding are the low precipitation, the hazard of wind erosion, and the duned topography.

This unit is not suited to irrigated crops because of the duned topography and the severe hazard of wind erosion.

Many limitations affect the use of this soil as a homesite. The soil does not adequately filter effluent in septic tank absorption fields. The sides of shallow excavations can cave in. The choppy, rolling topography also is a limitation.

The capability subclass is VIIs; Sands range site; windbreak suitability group 7.

75—Kandaly-Youjay complex, duned and gently sloping. This map unit is on upland plains and dunes along the eastern side of the survey area. The native vegetation is shrubs, forbs, and grasses. Individual areas are irregular in shape and range from 40 to 250 acres in size. They are about 40 percent Kandaly loamy fine sand, 3 to 20 percent slopes, and 40 percent Youjay clay loam, 1 to 5 percent slopes. The Kandaly soil occurs as interspersed dunes on gently sloping upland plains. The Youjay soil is between the dunes. The components of this unit occur as areas so intricately intermingled that mapping them separately was not practical.

Included with these soils in mapping are small areas of the Haterton soils that have a thin solum and small areas of Sobson soils. Included soils are between the dunes and areas of rock outcrop, which occurs as small buttes and scarps. The included soils make up about 20 percent of the unit. The percentage varies from one area to another.

The Kandaly soil is very deep and somewhat excessively drained. Typically, it is grayish brown loamy fine sand to a depth of 60 inches.

Permeability is rapid in the Kandaly soil. The available water capacity is 5 to 6 inches. The effective rooting depth is 60 inches or more. Runoff is slow or medium, and the hazard of water erosion is slight or moderate. The hazard of wind erosion is severe.

The Youjay soil is shallow and well drained. Typically, the surface layer is grayish brown clay loam about 1 inch thick. The upper part of the subsoil is grayish brown clay about 4 inches thick. The lower part is grayish brown very shaly clay loam about 5 inches thick. Shale is at a depth of about 10 inches.

Permeability is slow in the Youjay soil. The available water capacity is 1 to 2 inches. The effective rooting depth is 10 to 15 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of wind erosion also is moderate. This soil is strongly alkaline or very strongly alkaline.

All of this unit is rangeland. It provides food and cover for antelope, small mammals, and birds.

The potential plant community on the Kandaly soil is mainly needleandthread, Indian ricegrass, bottlebrush squirreltail, spiny hopsage, and greasewood. The production of air-dry vegetation is about 500 pounds per acre in normal years. It ranges from 350 pounds in unfavorable years to 700 pounds in favorable years.

The potential plant community on the Youjay soil is mainly bottlebrush squirreltail, Indian ricegrass, gardner saltbush, bud sagewort, and greasewood. The production of air-dry vegetation is about 350 pounds per acre in normal years. It ranges from 250 pounds in unfavorable years to 450 pounds in favorable years.

If the quality of the vegetation on this unit deteriorates because of overgrazing, grasses decrease in abundance and shrubs and unpalatable forbs increase. Under further deterioration, annual weeds invade the unit. Suitable management practices are deferred grazing, rotation grazing, and brush control. The main limitations affecting range seeding are the low precipitation and the duned topography.

This unit is not suited to cropland or homesites. The main limitations in areas of cropland are the duned topography of the Kandaly soil and the strongly alkaline reaction and shallowness to bedrock in the Youjay soil. The main limitation on homesites is the shallowness to bedrock in the Youjay soil.

The Kandaly soil is in capability subclass VIIe; Sands range site. The Youjay soil is in capability subclass VIIs; Saline Upland range site. The Kandaly soil is in windbreak suitability group 7, and the Youjay soil is in windbreak suitability group 10.

76—Littlebear loamy sand, 0 to 2 percent slopes. This nearly level, very deep, moderately well drained soil is in slight depressions on valley floors. Individual areas are irregular in shape and range from 5 to 100 acres in size. The native vegetation is mostly salt-tolerant shrubs, forbs, and grasses.

Included with this soil in mapping are small areas of Vonason and Hooper soils on slight rises on the valley floors. These soils make up about 10 percent of the unit. The percentage varies from one area to another.

Typically, the Littlebear soil has a surface layer of pale brown loamy sand about 2 inches thick. The subsoil is brown sandy loam about 7 inches thick. The upper part of the substratum is light gray and very pale brown, sodic sandy loam about 13 inches thick. The lower part to a depth of 60 inches or more is very pale brown loamy sand.

Permeability is moderately rapid. The available water capacity is 4 to 6 inches. The water table is at a depth of 4 to 5 feet during the irrigation season. The effective rooting depth is 60 inches or more. This soil is slightly saline or moderately saline. Runoff is slow, and the hazard of water erosion is slight. The hazard of wind erosion is severe.

Most of this unit is used for grazing. Some areas are used for irrigated crops, mainly grass hay and barley. The unit provides habitat for antelope, rabbits, other small mammals, and birds.

The potential plant community in the areas of rangeland is mainly western wheatgrass, alkali sacaton, inland saltgrass, and greasewood. The production of air-dry vegetation is about 1,000 pounds per acre in normal years. It ranges from 800 pounds in unfavorable years to 1,200 pounds in favorable years. If the quality of the vegetation deteriorates, inland saltgrass and greasewood increase in abundance. Under further deterioration, annual weeds invade the unit. Suitable management practices are deferred grazing, rotation grazing, and brush control. The limitations affecting range seeding are the alkalinity of the soil and the low precipitation.

In areas of irrigated cropland, a sprinkler system is the most efficient method of irrigation. A drainage system helps to lower the content of salts in the soil. Salt-tolerant grasses, such as tall wheatgrass, crested wheatgrass, and perennial ryegrass, should be selected for planting in areas seeded for hay.

This unit is not well suited to homesites because of the irrigation-induced water table and the content of salts, which is a limitation in areas used for lawns or gardens.

The capability subclass is VIs, dryland, and IVs, irrigated; Saline Lowland range site; irrigation design group 14; windbreak suitability group 7.

77—Means-Farson sandy loams, 0 to 1 percent slopes. This map unit is in level areas on valley floors throughout the survey area. The native vegetation is shrubs, forbs, and grasses. Individual areas are irregular in shape and range from 20 to 1,000 acres in size. They are about 50 percent Means sandy loam and 40 percent Farson sandy loam that has a bedrock substratum. The components of this unit occur as areas so intricately intermingled that mapping them separately was not practical.

Included with these soils in mapping are small areas of Farson and Elk Mountain soils on the valley floors. These included soils make up about 10 percent of the unit. The percentage varies from one area to another.

The Means soil is moderately deep and well drained. Typically, the surface layer is grayish brown sandy loam about 3 inches thick. The subsoil is brown sandy loam about 14 inches thick. The next layer is 21 inches thick. The upper part of this layer is brown loamy coarse sand, and the lower part is brown gravelly sand. Shale is at a depth of about 38 inches.

Permeability is moderate in the Means soil. The available water capacity is 3 to 4 inches. The effective rooting depth is 30 to 40 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of wind erosion is moderate.

The Farson soil is deep and well drained. Typically, the surface layer is grayish brown sandy loam about 3 inches thick. The subsoil is dark yellowish brown sandy loam about 14 inches thick. The next layer is brown and light brownish gray gravelly sand about 28 inches thick. Shale is at a depth of about 45 inches.

Permeability is moderate in the Farson soil. The available water capacity is 3 to 4 inches. The effective rooting depth is 40 to 60 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of wind erosion is moderate.

About half this unit is rangeland, and half is irrigated cropland. The unit provides food and cover for antelope, sage grouse, rabbits, other small mammals, and birds.

The potential plant community in the areas of rangeland is mainly needleandthread, thickspike wheatgrass, Indian ricegrass, needleleaf sedge, big sagebrush, and rubber rabbitbrush. The production of air-dry vegetation is about 500 pounds per acre in normal years. It ranges from 300 pounds in unfavorable years to 700 pounds in favorable years. If the quality of the vegetation deteriorates because of overgrazing, shrubs and unpalatable forbs increase in abundance. Under further deterioration, annual weeds invade the unit. Suitable management practices are deferred grazing, rotation grazing, and brush control. The main limitation affecting range seeding is the low precipitation.

Border dike, border ditch, and sprinkler irrigation methods are used in cropped areas. Sprinkler irrigation is the most efficient method. Because of the low available water capacity, frequently applying about 3 inches of water is the best means of irrigating. During the irrigation season, a perched water table may develop above the bedrock. Leaving crop residue on the surface helps to control wind erosion. Incorporating crop residue and other organic material into the soil improves tilth and increases the rate of water infiltration.

This unit is well suited to homesites. The shallowness to bedrock interferes with the operation and construction of septic tank absorption fields and is a limitation in shallow excavations. The sides of these excavations are likely to cave in.

The capability subclass is VIs, dryland, and IVs, irrigated; Sandy range site; irrigation design group 13. The Means soil is in windbreak suitability group 6R, and the Farson soil is in windbreak suitability group 6G.

78—Means-Farson sandy loams, 1 to 3 percent slopes. This map unit is in gently undulating areas on valley floors throughout the survey area. The native vegetation is shrubs, forbs, and grasses. Individual areas are irregular in shape and range from 10 to 600 acres in size. They are about 50 percent Means sandy loam and 40 percent Farson sandy loam that has a bedrock substratum. The components of this unit occur as areas so intricately intermingled that mapping them separately was not practical.

Included with these soils in mapping are small areas of Farson and Elk Mountain soils on the valley floors. These included soils make up about 10 percent of the unit. The percentage varies from one area to another.

The Means soil is moderately deep and well drained. Typically, the surface layer is grayish brown sandy loam about 3 inches thick. The subsoil is brown sandy loam about 14 inches thick. The next layer is about 21 inches thick. The upper part of this layer is brown loamy coarse sand, and the lower part is brown gravelly sand. Shale is at a depth of about 38 inches.

Permeability is moderate in the Means soil. The available water capacity is 3 to 4 inches. The effective rooting depth is 30 to 40 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of wind erosion is moderate.

The Farson soil is deep and well drained. Typically, the surface layer is grayish brown sandy loam about 3 inches thick. The subsoil is dark yellowish brown sandy loam about 14 inches thick. The next layer is brown and light brownish gray gravelly sand about 28 inches thick. Shale is at a depth of about 45 inches.

Permeability is moderate in the Farson soil. The available water capacity is 3 to 4 inches. The effective rooting depth is 40 to 60 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of wind erosion is moderate.

Most of this unit is rangeland. Some areas are used as irrigated cropland, and a few areas are used as homesites. The unit provides cover for antelope, sage grouse, rabbits, other small mammals, and birds.

The potential plant community in the areas of rangeland is mainly needleandthread, thickspike wheatgrass, Indian ricegrass, needleleaf sedge, big sagebrush, and rubber rabbitbrush. The production of air-dry vegetation is about 500 pounds per acre in normal years. It ranges from 300 pounds in unfavorable years to 700 pounds in favorable years. If the quality of the vegetation deteriorates because of overgrazing, grasses decrease in abundance and shrubs and unpalatable forbs increase. Under further deterioration, annual weeds invade the unit. Suitable management practices are deferred grazing, rotation grazing, and brush control. The main limitation affecting range seeding is the low precipitation.

Contour ditch and sprinkler irrigation methods are used in cultivated areas. Sprinkler irrigation is the most efficient method. Because of the low available water capacity, frequently applying about 3 inches of water is the best means of irrigating. During the irrigation season a perched water table may develop above the bedrock. Leaving crop residue on the surface helps to control wind erosion. Incorporating crop residue and other organic material into the soil improves tilth and increases the rate of water infiltration.

This unit is well suited to homesites. The underlying bedrock in the Means soil interferes with the operation and construction of septic tank absorption fields. The Farson soil is poorly suited to septic tank absorption fields. The sides of shallow excavations are likely to cave in.

The capability subclass is VIs, dryland, and IVs, irrigated; Sandy range site; irrigation design group 13. The Means soil is in windbreak suitability group 6R, and the Farson soil is in windbreak suitability group 6G.

79—Means Variant sandy loam, 0 to 1 percent slopes. This level, moderately deep, moderately well drained soil is on valley floors in the northern part of the survey area. Individual areas are irregular in shape and range from 10 to 300 acres in size. The native vegetation is salt-tolerant shrubs, forbs, and grasses.

Included with this soil in mapping are small areas of the Farson soils that have a bedrock substratum and small areas of Littlebear and Means soils. Also included are areas of a soil that is somewhat poorly drained and commonly has a ⅛-inch-thick, white salt crust on the surface during part of the year. Included soils are on the valley floors. They make up about 15 percent of the unit. The percentage varies from one area to another.

Typically, the Means Variant has a surface layer of grayish brown sandy loam about 2 inches thick. It has a spotty, thin white salt coating. The upper part of the subsoil is yellowish brown sandy loam about 11 inches thick. The lower part is brown loamy coarse sand about 11 inches thick. The next layer is pale brown gravelly sand about 15 inches thick. Sandstone is at a depth of about 39 inches.

Permeability is moderate. The available water capacity is 2 to 3 inches. The water table is at a depth of about 3 feet during the irrigation season. This unit has an irrigation-induced perched water table above the bedrock. The effective rooting depth is 20 to 40 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of wind erosion is moderate.

About half of this unit is rangeland, and half is irrigated cropland. Some areas of cropland are idle because of the saline-alkali condition. The unit provides food and cover for birds and other wildlife.

The potential plant community in the areas of rangeland is mainly western wheatgrass, inland saltgrass, Indian ricegrass, big sagebrush, greasewood, and rubber rabbitbrush. The production of air-dry vegetation is about 1,000 pounds per acre in normal years. It ranges from 700 pounds in unfavorable years to 1,200 pounds in favorable years. If the quality of the vegetation deteriorates because of overgrazing, most grasses decrease in abundance and inland saltgrass and shrubs increase. Under further deterioration, annual weeds invade the unit. Suitable management practices are deferred grazing, rotation grazing, and brush control. The main limitations affecting range seeding are the saline-alkali condition of the surface and the low precipitation.

A drainage system and a sprinkler irrigation system in which small amounts of water are applied are needed on this unit and in the surrounding areas because of the water table. These measures help to leach salts and improve productivity. Good management that includes applications of fertilizer and irrigation water can increase yields to 2.5 tons of hay or 50 bushels of barley per acre per year. Salt-tolerant forage grasses, such as tall wheatgrass, crested wheatgrass, and tall fescue, should be selected for planting.

This unit is not suitable for homesites. The main limitations are the water table and the saline-alkali condition. The sides of shallow excavations are likely to cave in.

The capability subclass is VIs, dryland, and IVs, irrigated; Saline Lowland range site; irrigation design group 13; windbreak suitability group 6R.

80—Mishak-Mishak Variant complex, 0 to 3 percent slopes. This map unit is on nearly level bottom land and in depressions throughout the survey area. The Mishak Variant soil is occasionally flooded. The native vegetation on the unit is salt-tolerant shrubs, forbs, and grasses. Individual areas are irregular in shape and range from 20 to 1,000 acres in size. They are about 50 percent Mishak fine sandy loam and 30 percent Mishak Variant sandy loam. The components of this unit occur as areas so intricately intermingled that mapping them separately was not practical.

Included with these soils in mapping are small areas of Debone Variant, Gunbarrel, Shellcreek Variant, and Littlebear soils on the bottom land and in the depressions. These soils make up about 20 percent of the unit. The percentage varies from one area to another.

The Mishak soil is very deep and is somewhat poorly drained or poorly drained. Typically, the surface has a salt crust that is ¼ inch thick. The surface layer is pale brown fine sandy loam about 5 inches thick. The subsoil is light gray, mottled sandy clay loam about 4 inches thick. The substratum to a depth of 60 inches is olive gray, gray, and light gray, mottled, stratified fine sandy loam, clay loam, and sandy clay loam.

Permeability is moderate in the Mishak soil. The available water capacity is 7 to 9 inches. Capillary water is supplied by the water table, which is at a depth of 1 to 3 feet during most spring and summer months. The effective rooting depth is 60 inches or more. This soil is moderately saline in the surface layer and slightly saline in the substratum. It is strongly alkaline throughout.

The Mishak Variant soil is very deep and is somewhat poorly drained or poorly drained. Typically, the surface layer is about 1 inch of light gray sandy loam that has many crystalline salts. The subsurface layer is light brownish gray, strongly saline-alkaline sandy clay loam about 7 inches thick. The upper part of the substratum is light olive brown, light brownish gray, and yellowish brown sandy clay loam about 19 inches thick. The lower part to a depth of 60 inches is light olive brown and grayish brown loamy sand and gravelly loamy sand.

Permeability is moderate in the Mishak Variant soil. The available water capacity is 3 to 4 inches. Capillary water is supplied by the water table, which is at a depth of 1 to 3 feet during most spring and summer months. The effective rooting depth is 60 inches or more. Runoff on this unit is very slow. The soils receive runoff and seepage from surrounding areas. The hazards of wind erosion and water erosion are slight.

All of this unit is rangeland. It provides some food and cover for small mammals and birds.

The potential plant community is mainly inland saltgrass, alkali sacaton, thickspike wheatgrass, and greasewood. The production of air-dry vegetation is about 1,200 pounds per acre in normal years. It ranges from 800 pounds in unfavorable years to 1,600 pounds in favorable years. Suitable management practices are deferred grazing, rotation grazing, and brush control. The main limitations affecting range seeding are the salinity and alkalinity and the wetness.

Because of the water table, the hazard of flooding, and the salinity and alkalinity, this unit is not suited to cropland or homesites.

The capability subclass is VIw; Saline Lowland range site. The Mishak soil is in windbreak suitability group 9G, and the Mishak Variant soil is in windbreak suitability group 10.

81—Quealman-Fluvaquents complex, 0 to 3 percent slopes. This map unit is on level and nearly level bottom land along the Big Sandy River and Little Sandy Creek (fig. 3). It is subject to rare flooding. The Fluvaquents are in abandoned oxbows and other low areas. Individual areas are irregularly shaped or long and narrow and range from 10 to 300 acres in size. They are about 60 percent Quealman fine sandy loam and 30 percent Fluvaquents. The components of this unit occur as areas so intricately intermingled that mapping them separately was not practical.

Included with these soils in mapping are small areas of Clowers, Gunbarrel, Littlebear, and Debone Variant soils on the bottom land. These included soils make up about 10 percent of the unit. The percentage varies from one area to another.

The Quealman soil is very deep and moderately well drained. Typically, the surface layer is grayish brown fine sandy loam about 12 inches thick. The substratum to a depth of 60 inches is stratified brown, pale brown, light brownish gray, and light gray fine sandy loam, loamy fine sand, loam, and sand.

Permeability is moderately rapid in the Quealman soil. The available water capacity is 7 to 9 inches. The seasonal high water table is at a depth of 2.0 to 3.5 feet. The effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight in all areas, except for those that are subject to streambank cutting. The hazard of wind erosion is slight.

Fluvaquents are very deep and poorly drained. They have strata of clay loam, loam, sandy loam, and gravelly sand.

Permeability is moderate to moderately rapid in the Fluvaquents. The available water capacity is 3 to 8 inches. Capillary water is supplied by the water table, which is within a depth of 3 feet during spring and summer. The effective rooting depth is 60 inches or more.

All of this unit is rangeland. It provides food and cover for deer, sage grouse, rabbits, other small mammals, and birds.

The potential plant community on the Quealman soil is mainly western wheatgrass, needleandthread, basin wildrye, big sagebrush, and rubber rabbitbrush. The production of air-dry vegetation is about 1,500 pounds per acre in normal years. It ranges from 1,000 pounds in unfavorable years to 2,000 pounds in favorable

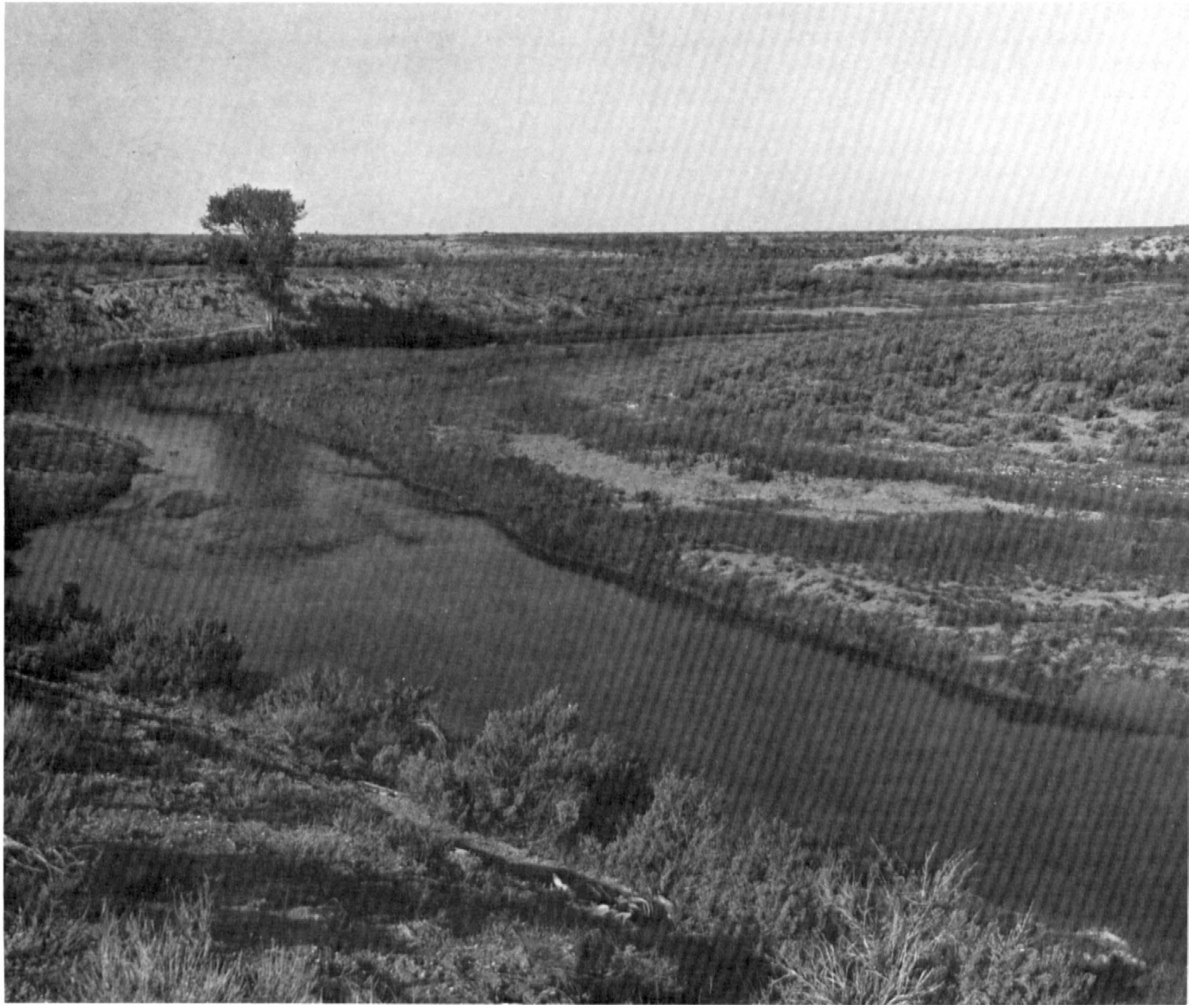

Figure 3.—An area of the Quealman-Fluvaquents complex, 0 to 3 percent slopes, along the far side of the Big Sandy River.

years. If the quality of the vegetation deteriorates because of overgrazing, shrubs increase in abundance. Under further deterioration, annual weeds invade the unit.

The potential plant community on the Fluvaquents is mainly basin wildrye, Nebraska sedge, tufted hairgrass, and cinquefoil. The production of air-dry vegetation is about 3,000 pounds per acre in normal years. It ranges from 2,300 pounds in unfavorable years to 3,500 pounds in favorable years. If the quality of the vegetation deteriorates because of overgrazing, foxtail and other annual grasses invade the unit. Under further deterioration, sedges and rushes dominate the unit. Suitable management practices are deferred grazing, rotation grazing, and brush control.

Small areas of the Quealman soil could be converted to cropland. Land leveling probably would be needed. The cropland would be irrigated by border dike or border ditch methods because the soils are in areas between streams and streambanks where operating sprinkler systems would be difficult.

Because of the hazard of flooding, this unit is not suitable for homesites.

The Quealman soil is in capability subclass VIe, dryland, and IVe, irrigated; Lowland range site; irrigation design group 14. The Fluvaquents are in capability subclass Vw; Subirrigated range site; windbreak suitability group 1K.

82—Shellcreek silty clay, 0 to 1 percent slopes. This level, very deep, moderately well drained soil is on valley floors along the east side of the survey area. It is subject to rare flooding. Individual areas are irregular in shape and range from 10 to 300 acres in size. The native vegetation is salt-tolerant shrubs, forbs, and grasses.

Included with this soil in mapping are small areas of a soil that is silty clay loam throughout. This included soil makes up about 10 percent of the unit. The percentage varies from one area to another.

Typically, the Shellcreek soil has a surface layer of light olive gray silty clay about 3 inches thick. The subsoil is pale olive silty clay about 17 inches thick. The substratum to a depth of 60 inches also is pale olive silty clay. It has a few soft masses of carbonates and sulfates in the upper part.

Permeability is slow. The available water capacity is 5 to 6 inches. The effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The soil occasionally receives runoff from adjacent areas. The hazard of wind erosion is moderate.

All of this unit is rangeland. It provides food and cover for antelope, small mammals, and birds.

The potential plant community is bottlebrush squirreltail, Indian ricegrass, bud sagewort, gardner saltbush, greasewood, and winterfat. The production of air-dry vegetation is about 450 pounds per acre in normal years. It ranges from 300 pounds in unfavorable years to 600 pounds in favorable years. If the quality of the vegetation deteriorates because of overgrazing, greasewood and birdfoot sagebrush increase in abundance. Under further deterioration, halogeton and annual weeds invade the unit. Suitable management practices are deferred grazing, rotation grazing, and brush control. The main limitation affecting range seeding is the sodic condition of the soil and the low precipitation.

Because of the sodicity and restricted internal drainage, this unit is not suited to irrigated crops. It is not suitable for homesites because of a high shrink-swell potential and the flooding.

The capability subclass is VIs, dryland; Saline upland range site; windbreak suitability group 9N.

83—Shellcreek silty clay, nonsodic, 0 to 1 percent slopes. This level, very deep, moderately well drained soil is in depressions on the west side of the survey area. It is subject to rare flooding. Individual areas are irregular in shape and range from 10 to 100 acres in size. The native vegetation is shrubs, forbs, and grasses.

Included with this soil in mapping are small areas of Shellcreek silty clay loam in depressions. This included soil makes up about 15 percent of the unit. The percentage varies from one area to another.

Typically, the Shellcreek soil has a surface layer of brown, granular silty clay about 3 inches thick. The subsoil is brown, columnar silty clay about 17 inches thick. The next layer is light brownish gray silty clay about 26 inches thick. The substratum to a depth of 60 inches is grayish brown silty clay.

Permeability is slow. The available water capacity is 5 to 6 inches. The effective rooting depth is 60 inches or more. This unit receives runoff from surrounding areas. The runoff accumulates on the surface of this soil. Water erosion is not a hazard. The hazard of wind erosion is moderate.

About half of this unit is rangeland, and half is irrigated cropland. The unit provides food and cover for antelope, small mammals, and birds.

The potential plant community in the areas of rangeland is mainly bottlebrush squirreltail, Indian ricegrass, thickspike wheatgrass, low sagebrush, and low rabbitbrush. The production of air-dry vegetation is about 500 pounds per acre in normal years. It ranges from 300 pounds in unfavorable years to 700 pounds in favorable years. If the quality of the vegetation deteriorates because of overgrazing, the shrubs and unpalatable forbs increase in abundance. Under further deterioration, annual weeds invade the unit. Suitable management practices are deferred grazing, rotation grazing, and brush control. The main limitation affecting range seeding is the low precipitation.

In the areas used as irrigated cropland, border dike or sprinkler irrigation methods are suitable. Because of restricted internal drainage, however, waterlogging is a hazard. Leaving crop residue on the surface helps to control wind erosion. Incorporating crop residue and other organic material into the soil improves tilth and increases the rate of water infiltration.

This unit is not suitable for homesites because of a high shrink-swell potential and the hazard of flooding.

The capability subclass is VIs, dryland, and IVs, irrigated; Clayey range site; irrigation design group 4; windbreak suitability group 9N.

84—Shellcreek silty clay, nonsodic, 1 to 3 percent slopes. This very gently sloping, very deep, moderately well drained soil is in depressions on the west-central side of the survey area. It occurs as one irregularly shaped area about 150 acres in size. The native vegetation is shrubs, forbs, and grasses.

Typically, the surface layer is brown, granular silty clay about 3 inches thick. The subsoil is brown, columnar silty clay about 17 inches thick. The next layer is light brownish gray silty clay about 26 inches thick. The substratum to a depth of 60 inches is grayish brown silty clay.

Permeability is slow. The available water capacity is 5 to 6 inches. The effective rooting depth is 60 inches or more. Runoff is slow or medium, and the hazard of water erosion is slight or moderate. The hazard of wind erosion is moderate.

About half of this unit is rangeland and half is irrigated cropland. The unit provides food and cover for antelope, small mammals, and birds.

The potential plant community in the areas of rangeland is mainly bottlebrush squirreltail, Indian ricegrass, thickspike wheatgrass, low sagebrush, and low rabbitbrush. The production of air-dry vegetation is about 500 pounds per acre in normal years. It ranges from 300 pounds in unfavorable years to 700 pounds in favorable years. If the quality of the vegetation deteriorates because of overgrazing, shrubs and unpalatable forbs increase in abundance. Under further deterioration, annual weeds invade the unit. Suitable management practices are deferred grazing, rotation grazing, and brush control. The main limitation affecting range seeding is the low precipitation.

In the areas used as irrigated cropland, contour ditch or sprinkler irrigation methods are suitable. Because of restricted internal drainage, however, waterlogging is a hazard. Leaving crop residue on the surface helps to control wind erosion. Incorporating crop residue and other organic material into the soil improves tilth and increases the rate of water infiltration.

This unit is not suited to homesites because of a high shrink-swell potential. The slow permeability is a severe limitation on sites for septic tank absorption fields.

The capability subclass is VIs, dryland, and IVs, irrigated; Clayey range site; irrigation design group 4; windbreak suitability group 9N.

85—Sobson-Pepton-Edlin complex, 0 to 6 percent slopes. This map unit is on nearly level to undulating upland plains that have minor alluvial fans. It is mainly on the west and south sides of the survey area. The native vegetation is shrubs, forbs, and grasses. Individual areas are irregular in shape and range from 10 to 500 acres in size. They are about 40 percent Sobson sandy loam, 0 to 6 percent slopes; 40 percent Pepton sandy loam, 0 to 6 percent slopes; and 15 percent Edlin fine sandy loam, 0 to 3 percent slopes. The Sobson soil is mainly on the side slopes and is also on some flats. The Pepton soil is mainly on the knolls. The Edlin soil is on the bottom of swales and on toe slopes. The components of this unit occur as areas so intricately intermingled that mapping them separately was not practical.

Included with these soils in mapping are small areas of a soil that is similar to the Pepton soil but has 15 to 35 percent channers throughout. Also included are areas of Rock outcrop. Included areas are on knolls. They make up about 5 percent of the unit. The percentage varies from one area to another.

The Sobson soil is moderately deep and well drained. Typically, the surface layer is grayish brown sandy loam about 2 inches thick. The subsoil is brown sandy loam about 10 inches thick. The substratum is about 23 inches thick. The upper part is pale brown sandy loam, and the lower part is pale brown channery sandy loam. Shale bedrock is at a depth of about 35 inches.

Permeability is moderately rapid in the Sobson soil. The available water capacity is 4 to 5 inches. The effective rooting depth is 20 to 40 inches.

The Pepton soil is shallow and well drained. Typically, the surface layer is light brownish gray sandy loam about 3 inches thick. The subsoil is pale brown sandy loam about 8 inches thick. The next layer is light olive brown channery sandy loam about 4 inches thick. Hard sandstone bedrock is at a depth of about 15 inches.

Permeability is moderately rapid in the Pepton soil. The available water capacity is about 1 inch. The effective rooting depth is 10 to 20 inches.

The Edlin soil is deep and well drained. Typically, the surface layer is brown fine sandy loam about 4 inches thick. The subsoil also is brown fine sandy loam. It is about 7 inches thick. The substratum to a depth of 60 inches is pale brown fine sandy loam.

Permeability is moderately rapid in the Edlin soil. The available water capacity is 7 to 8 inches. The effective rooting depth is generally 60 inches, but in some areas

Figure 4.—Winter feeding of beef cattle in an area of Sobson-Pepton-Edlin complex, 0 to 6 percent slopes.

it is restricted by bedrock at a depth of 40 to 60 inches. Runoff is slow or medium, and the hazard of water erosion is slight or moderate. The hazard of wind erosion is moderate.

All of this unit is rangeland (fig. 4). It provides food and cover for antelope, sage grouse, rabbits, other small mammals, and birds.

The potential plant community on the Sobson and Edlin soils is mainly needleandthread, thickspike wheatgrass, Indian ricegrass, needleleaf sedge, big sagebrush, and rubber rabbitbrush. The production of air-dry vegetation is about 500 pounds per acre in normal years. It ranges from 300 pounds in unfavorable years to 700 pounds in favorable years.

The potential plant community on the Pepton soil is mainly bluebunch wheatgrass, Indian ricegrass, thickspike wheatgrass, needleleaf sedge, and big sagebrush. The production of air-dry vegetation is about 350 pounds per acre in normal years. It ranges from 200 pounds in unfavorable years to 450 pounds in favorable years.

If the quality of the vegetation on this unit deteriorates because of overgrazing, shrubs and unpalatable forbs increase in abundance. Under further deterioration, annual weeds invade the unit. Suitable management practices are deferred grazing, rotation grazing, and brush control. The main limitation affecting range seeding is the low precipitation.

The Sobson and Pepton soils are not suitable as sites for homes because of the limited depth to bedrock. The bedrock interferes with the operation and construction of septic tank absorption fields and is a limitation in shallow excavations.

The Sobson and Edlin soils are in capability subclass VIs; Sandy range site. The Pepton soil is in capability subclass VIIs; Shallow Sandy range site. The Sobson soil is in windbreak suitability group 6R, the Pepton soil is in windbreak suitability group 10, and the Edlin soil is in windbreak suitability group 6G.

86—Space City loamy sand, 0 to 3 percent slopes. This nearly level, very deep, somewhat excessively drained soil is on valley floors, mainly in the southeastern part of the survey area, and is in a band around the east shore of Eden Reservoir. Individual areas are irregular in shape and range from 70 to 1,000 acres in size. The native vegetation is shrubs, forbs, and grasses.

Included with this soil in mapping are small areas of Cotopaxi soils, which occur as small, isolated dunes. These included soils make up about 5 percent of the unit. The percentage varies from one area to another.

Typically, the Space City soil has a surface layer of brown loamy sand about 16 inches thick. The next layer is grayish brown loamy sand about 10 inches thick. The substratum to a depth of 60 inches is light gray loamy sand.

Permeability is rapid. The available water capacity is 3 to 5 inches. The effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of wind erosion is severe.

All of this unit is rangeland. It provides food and cover for antelope, rabbits, other small mammals, and birds.

The potential plant community on this soil is mainly needleandthread, Indian ricegrass, needleleaf sedge, spiny hopsage, big sagebrush, and rubber rabbitbrush. The production of air-dry vegetation is about 500 pounds per acre in normal years. It ranges from 350 pounds in unfavorable years to 700 pounds in favorable years. If the quality of the vegetation deteriorates because of overgrazing, shrubs increase in abundance. Under further deterioration, annual weeds invade the unit. Suitable management practices are deferred grazing, rotation grazing, and brush control. The main limitations affecting range seeding are low precipitation and the hazard of wind erosion.

Some areas of this unit can be used as irrigated cropland if water is available. Water should be applied by sprinkler systems. A ditch system would be very inefficient. Other limitations in cropped areas are the low available water capacity and the hazard of wind erosion. Leaving crop residue on the surface helps to control wind erosion. Good management that includes applications of fertilizer and sprinkler irrigation can increase annual yields to 3 tons of alfalfa or grass hay, 50 bushels of barley, and 60 bushels of oats per acre.

This unit is well suited to homesites. Septic tank absorption fields function well, but the effluent can pollute ground water because of the highly porous substratum. The sides of shallow excavations are likely to cave in.

The capability subclass is VIIs, dryland, and IVs, irrigated; Sands range site; irrigation design group 17; windbreak suitability group 7.

87—Space City loamy sand, 8 to 30 percent slopes. This moderately steep, very deep, somewhat excessively drained soil is on terrace scarps throughout the survey area. Slopes are about 300 to 400 feet long. Individual areas are long and narrow and range from 5 to 100 acres in size. The native vegetation is shrubs, forbs, and grasses.

Included with this soil in mapping are small areas of Edlin, Sobson, and Vonason soils. Edlin soils are on the foot slopes of the scarps. Sobson and Vonason soils are on the shoulders of the scarps. Included soils make up about 15 percent of the unit. The percentage varies from one area to another.

Typically, the Space City soil has a surface layer of grayish brown loamy sand about 10 inches thick. The substratum to a depth of about 60 inches is pale brown loamy sand.

Permeability is rapid. The available water capacity is 3 to 5 inches. The effective rooting depth is 60 inches or more. Runoff is only medium on this moderately steep soil because of a high water infiltration rate. The hazard of water erosion is moderate. The hazard of wind erosion is severe.

All of this unit is rangeland. It provides food and cover for antelope, deer, sage grouse, rabbits, other small mammals, and birds.

The potential plant community is somewhat varied. The upper half of the scarp supports needleandthread, Indian ricegrass, needleleaf sedge, thickspike wheatgrass, spiny horsebrush, and low sagebrush. The lower half supports thickspike wheatgrass, Indian ricegrass, bluebunch wheatgrass, rubber rabbitbrush, and big sagebrush. The production of air-dry vegetation is about 500 pounds per acre in normal years. It ranges from 300 pounds in unfavorable years to 700 pounds in favorable years. If the quality of the vegetation deteriorates because of overgrazing, grasses decrease in abundance and shrubs increase. Under further deterioration, annual weeds invade the unit. Suitable management practices are deferred grazing, rotation grazing, and brush control. The main limitations affecting range seeding are the low precipitation, the slope, and the hazard of wind erosion.

Because of the slope, this unit is not suitable for irrigated cropland or homesites.

The capability subclass is VIIe, dryland; Sands range site; windbreak suitability group 7.

88—Vonason loamy sand, 0 to 1 percent slopes. This level, very deep, well drained soil is on valley floors in the southern part of the survey area. Individual areas are irregular in shape and range from 30 to 600 acres in size. The native vegetation is shrubs, forbs, and grasses.

Included with this soil in mapping are small areas of Farson, Means, and Space City soils on the valley floors. These soils make up about 10 percent of the unit. The percentage varies from one area to another.

Typically, the Vonason soil has a surface layer of grayish brown loamy sand about 3 inches thick. The subsoil is brown sandy loam about 16 inches thick. The substratum to a depth of 60 inches is light brownish gray gravelly loamy sand.

Permeability is moderately rapid. The available water capacity is 4 to 5 inches. The effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of wind erosion is severe.

About half of this unit is used for grazing and half for irrigated cropland. A few areas are used for homesites. The unit provides habitat for antelope, sage grouse, rabbits, other small mammals, and birds.

The potential plant community in the areas of rangeland is mainly needleandthread, thickspike wheatgrass, Indian ricegrass, needleleaf sedge, big sagebrush, and rubber rabbitbrush. The production of air-dry vegetation is about 500 pounds per acre in normal years. It ranges from 300 pounds in unfavorable years to 700 pounds in favorable years. If the quality of the vegetation deteriorates because of overgrazing, shrubs and unpalatable forbs increase in abundance. Under further deterioration, annual weeds invade the unit. Suitable management practices are deferred grazing, rotation grazing, and brush control. The main limitation affecting range seeding is the low precipitation.

In the areas of irrigated cropland, the main limitations are a short growing season, the severe hazard of wind erosion, and a low available water capacity. If a ditch irrigation system is used, the length of the runs should be short because of the high infiltration rate. A sprinkler system is the most efficient irrigation method. Because of the low available water capacity, frequently applying about 2.5 inches of water is the best means of irrigating. Leaving crop residue on the surface helps to control wind erosion.

This unit is well suited to homesites. Septic tank absorption fields function well, but the effluent can pollute ground water because of the highly porous substratum. The sides of shallow excavations are likely to cave in.

The capability subclass is VIs, dryland, and IVs, irrigated; Sandy range site; irrigation design group 14; windbreak suitability group 7.

89—Vonason loamy sand, 1 to 3 percent slopes. This nearly level, very deep, well drained soil is on valley floors in the southern part of the survey area. Individual areas are irregular in shape and range from 10 to 2,000 acres in size. The native vegetation is shrubs, forbs, and grasses.

Included with this soil in mapping are small areas of Farson, Means, and Space City soils on the valley floors. These soils make up about 10 percent of the unit. The percentage varies from one area to another.

Typically, the Vonason soil has a surface layer of grayish brown loamy sand about 3 inches thick. The subsoil is brown sandy loam about 16 inches thick. The substratum to a depth of 60 inches is light brownish gray gravelly loamy sand.

Permeability is moderately rapid. The available water capacity is 4 to 5 inches. The effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of wind erosion is severe.

About half of this unit is used for grazing and half for irrigated cropland. A few areas are used for homesites. The unit also provides habitat for antelope, sage grouse, rabbits, other small mammals, and birds.

The potential plant community in the areas of rangeland is mainly needleandthread, thickspike wheatgrass, Indian ricegrass, needleleaf sedge, big sagebrush, and rubber rabbitbrush. The production of air-dry vegetation is about 500 pounds per acre in normal years. It ranges from 300 pounds in unfavorable years to 700 pounds in favorable years. If the quality of the vegetation deteriorates because of overgrazing, shrubs and unpalatable forbs increase in abundance. Under further deterioration, annual weeds invade the unit. Suitable management practices are deferred grazing, rotation grazing, and brush control. The main limitation affecting range seeding is the low precipitation.

In the areas of irrigated cropland, land leveling may be needed because of the slope. The other main limitations are a short growing season, the severe hazard of wind erosion, and a low available water capacity. If a ditch irrigation system is used, the length of the runs should be short because of the high infiltration rate. A sprinkler system is the most efficient irrigation method. Because of the low available water capacity, frequently applying about 2.5 inches of water is the best means of irrigating. Leaving crop residue on the surface helps to control wind erosion. Good management that includes applications of fertilizer and sprinkler irrigation can increase annual yields to 4 tons of alfalfa or grass hay, 70 bushels of barley, and 90 bushels of oats per acre.

This unit is well suited to homesites. Septic tank absorption fields function well, but the effluent can pollute ground water because of the highly porous substratum. The sides of shallow excavations are likely to cave in.

The capability subclass is VIs, dryland, and IVs, irrigated; Sandy range site; irrigation design group 14; windbreak suitability group 7.

90—Vonason loamy sand, 3 to 6 percent slopes. This gently sloping, very deep, well drained soil is on short slopes on valley floors, mainly in the southern part of the survey area. Slopes are about 300 to 400 feet long. Individual areas are irregular in shape and range from 5 to 60 acres in size. The native vegetation is shrubs, forbs, and grasses.

Included with this soil in mapping are small areas of Means and Space City soils on the valley floors. These soils make up about 10 percent of the unit. The percentage varies from one area to another.

Typically, the Vonason soil has a surface layer of pale brown loamy sand about 2 inches thick. The subsoil is light yellowish brown and light gray sandy loam about 13 inches thick. The substratum to a depth of 60 inches is light gray loamy sand.

Permeability is moderately rapid. The available water capacity is 4 to 5 inches. The effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate. The hazard of wind erosion is severe.

Most of this unit is used for grazing, but a few areas are used for irrigated cropland. The unit also provides habitat for antelope, sage grouse, rabbits, other small mammals, and birds.

The potential plant community is mainly needleandthread, thickspike wheatgrass, Indian ricegrass, needleleaf sedge, big sagebrush, and rubber rabbitbrush. The production of air-dry vegetation is about 500 pounds per acre in normal years. It ranges from 300 pounds in unfavorable years to 700 pounds in favorable years. If the quality of the vegetation deteriorates because of overgrazing, shrubs and unpalatable forbs increase in abundance. Under further deterioration, annual weeds invade the unit. Suitable management practices are deferred grazing, rotation grazing, and brush control. The main limitation affecting range seeding is the low precipitation.

In the areas of irrigated cropland, the main limitations are a short growing season, the moderate hazard of water erosion, the severe hazard of wind erosion, and a low available water capacity. If a ditch irrigation system is used, the length of the runs should be short because of the high infiltration rate. A sprinkler system is the most efficient irrigation method. Because of the low available water capacity, frequently applying about 2.5 inches of water is the best means of irrigating. Leaving crop residue on the surface helps to control wind erosion. Good management that includes applications of fertilizer and sprinkler irrigation can increase yields to 3 tons of alfalfa or grass hay, 50 bushels of barley, and 70 bushels of oats per acre.

This unit is well suited to homesites. Septic tank absorption fields function well, but the effluent can pollute ground water because of the highly porous substratum. The sides of shallow excavations are likely to cave in.

The capability subclass is VIs, dryland, and IVs, irrigated; Sandy range site; irrigation design group 14; windbreak suitability group 7.

91—Vonason-Cotopaxi complex, nearly level and duned. This map unit is on fan pediments in the southeastern part of the survey area. The Vonason soil is in nearly level areas on the piedmonts. The Cotopaxi soil is on scattered dunes. The native vegetation is shrubs, forbs, and grasses. Individual areas are irregular in shape and range from 5 to 500 acres in size. They are about 50 percent Vonason loamy sand, 0 to 3 percent slopes, and 40 percent Cotopaxi fine sand, 3 to 20 percent slopes. The components of this unit occur as areas so intricately intermingled that mapping them separately was not practical.

Included with these soils in mapping are small areas of Gunbarrel and Space City soils on the valley floors. These included soils make up about 10 percent of the unit. The percentage varies from one area to another.

The Vonason soil is very deep and well drained. Typically, the surface layer is brown loamy sand about 5 inches thick. The subsoil is brown sandy loam about 15 inches thick. The next layer is pale brown loamy sand about 6 inches thick. The substratum to a depth of 60 inches is light brownish gray sand.

Permeability is moderately rapid in the Vonason soil. The available water capacity is 4 to 5 inches. The effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of wind erosion is severe.

The Cotopaxi soil is very deep and somewhat excessively drained. Typically, the surface layer is light brownish gray fine sand about 8 inches thick. The substratum to a depth of 60 inches is pale brown fine sand.

Permeability is rapid in the Cotopaxi soil. The available water capacity is 2 to 4 inches. The effective rooting depth is 60 inches or more. Runoff is slow or medium, and the hazard of water erosion is slight or moderate. The hazard of wind erosion is severe.

All of this unit is rangeland, except for two very small areas included with the adjacent cropland. The unit provides food and cover for antelope, sage grouse, rabbits, other small mammals, and birds.

The potential plant community on the Vonason soil is mainly needleandthread, Indian ricegrass, thickspike wheatgrass, needleleaf sedge, big sagebrush, and rubber rabbitbrush. The production of air-dry vegetation is about 500 pounds per acre in normal years. It ranges from 300 pounds in unfavorable years to 700 pounds in favorable years.

The potential plant community on the Cotopaxi soil is mainly needleandthread, Indian ricegrass, thickspike wheatgrass, spiny hopsage, and rubber rabbitbrush. The production of air-dry vegetation is about 500 pounds per acre in normal years. It ranges from 350 pounds in unfavorable years to 700 pounds in favorable years.

If the quality of the vegetation on this unit deteriorates because of overgrazing, shrubs and unpalatable forbs increase in abundance. Under further deterioration, annual weeds invade the unit. Suitable management practices are deferred grazing, rotation grazing, and brush control. The main limitations affecting range seeding are the low precipitation, the duned terrain, and the severe hazard of wind erosion.

This unit is suited to homesites. Septic tank absorption fields function well, but the effluent can pollute ground water because of the porous substratum. The sides of shallow excavations are likely to cave in.

The Vonason soil is in capability subclass VIs, dryland; Sandy range site. The Cotopaxi soil is in capability subclass VIIs, dryland; Sands range site. Both soils are in windbreak suitability group 7.

92—Worfman-Diamondville sandy loams, 0 to 6 percent slopes. This map unit is mainly on the upland plains around the perimeter of the survey area. The native vegetation is shrubs, forbs, and grasses. Individual areas are irregular in shape and range from 10 to 1,000 acres in size. They are about 60 percent Worfman sandy loam and 20 percent Diamondville sandy loam. The components of this unit occur as areas so intricately intermingled that mapping them separately was not practical.

Included with these soils in mapping are small areas of Forelle soils in depressions. Also included, on knolls, are Pepton soils and a soil that is similar to the Worfman soil but is 6 to 10 inches deep over bedrock and is very channery and flaggy throughout. Included soils make up about 20 percent of the unit. The percentage varies from one area to another.

The Worfman soil is shallow and well drained. Typically, the surface layer is grayish brown sandy loam about 3 inches thick. The subsoil is yellowish brown clay loam about 9 inches thick. The next layer is brown clay loam about 2 inches thick. Shale bedrock is at a depth of about 14 inches (fig. 5).

Permeability is moderate in the Worfman soil. The available water capacity is about 2 inches. The effective rooting depth is 10 to 20 inches.

The Diamondville soil is moderately deep and well drained. Typically, the surface layer is grayish brown sandy loam about 2 inches thick. The upper part of the subsoil is yellowish brown clay loam about 8 inches thick. The lower part is light gray and light brownish gray clay loam about 10 inches thick. The next layer is light olive brown loam about 11 inches thick. Shale bedrock is at a depth of about 31 inches.

Permeability is moderately slow in the Diamondville soil. The available water capacity is 3 to 6 inches. The effective rooting depth is 20 to 40 inches. Runoff is slow or medium, and the hazard of water erosion is slight or moderate. The hazard of wind erosion is moderate.

All of this unit is rangeland, except for two very small areas included with adjacent cropland. The unit provides food and cover for antelope, sage grouse, rabbits, other small mammals, and birds.

The potential plant community on the Worfman soil is mainly bluebunch wheatgrass, Indian ricegrass, Sandberg bluegrass, thickspike wheatgrass, and big sagebrush. The production of air-dry vegetation is about 350 pounds per acre in normal years. It ranges from 200 pounds in unfavorable years to 450 pounds in favorable years.

The potential plant community on the Diamondville soil is mainly thickspike wheatgrass, needleandthread, Indian ricegrass, and big sagebrush. The production of air-dry vegetation is about 500 pounds per acre in normal years. It ranges from 300 pounds in unfavorable years to 700 pounds in favorable years.

If the quality of the vegetation on this unit

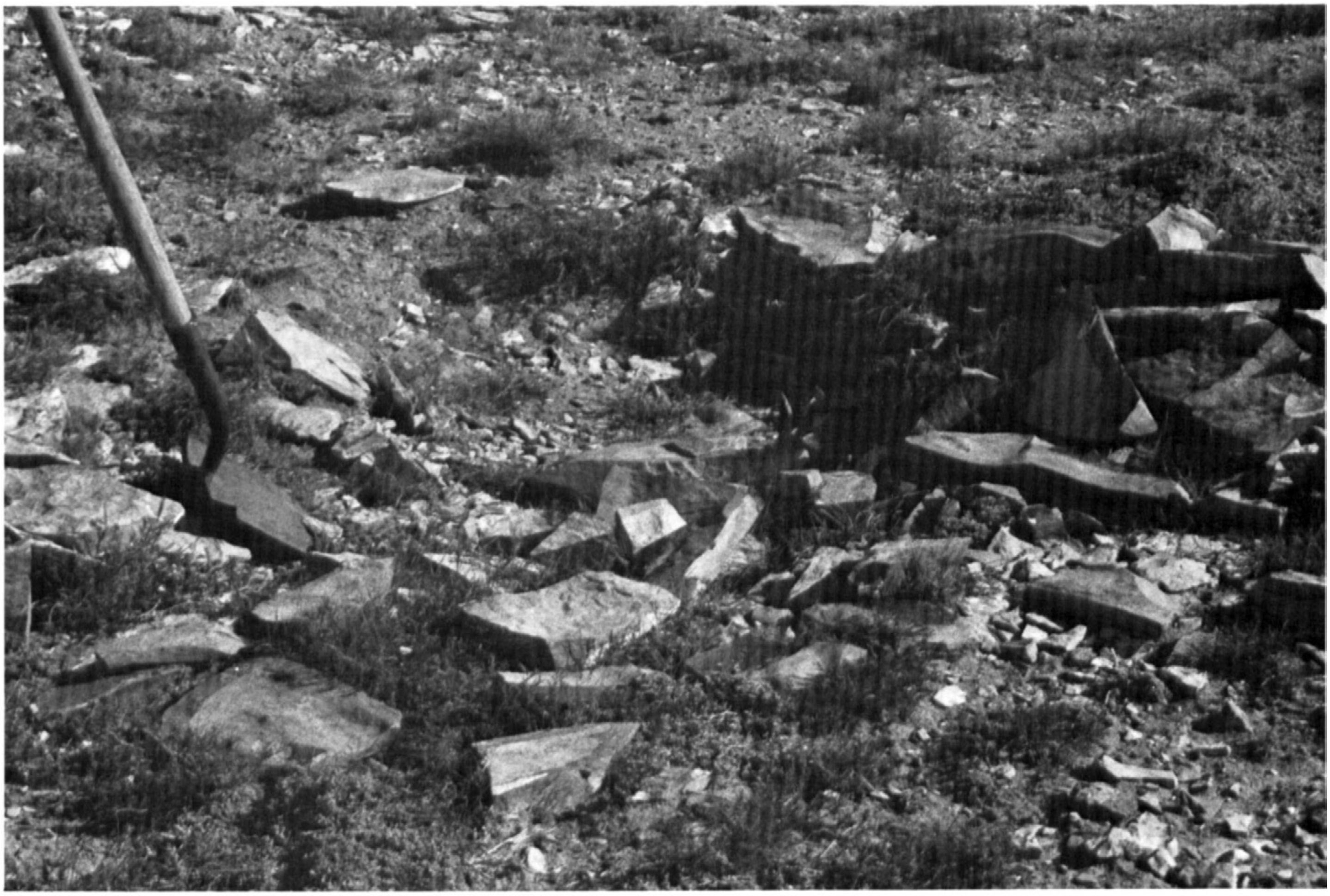

Figure 5.—An area of Worfman-Diamondville sandy loams, 0 to 6 percent slopes. Fish fossils can be excavated from the shale underlying the Worfman soil.

deteriorates because of overgrazing, shrubs and unpalatable forbs increase in abundance. Under further deterioration, annual weeds invade the unit. Suitable management practices are deferred grazing, rotation grazing, and brush control. The main limitation affecting range seeding is the low precipitation.

This unit is not suited to cropland or homesites because of the shallowness to bedrock. The bedrock is a limitation in shallow excavations and interferes with the operation and construction of septic tank absorption fields.

The Worfman soil is in capability subclass VIIe; Shallow Loamy range site. The Diamondville soil is in capability subclass VIe; Loamy range site. The Worfman soil is in windbreak suitability group 10. The Diamondville soil is in windbreak suitability group 6R.

93—Pits, borrow and gravel. This map unit consists of open excavations in areas where the soil and underlying material have been removed. It is used as a source of gravel and fill. These areas support no vegetation or have only a sparse cover of grasses and annual weeds.

The capability subclass is VIIIs; windbreak suitability group 10.

Use and Management of the Soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavioral characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; for windbreaks; as rangeland and woodland; as sites for buildings, sanitary facilities, and highways and other transportation systems; and for wildlife habitat. It can be used to identify the limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

Crops

Carl Tomich, district conservationist, Soil Conservation Service, helped prepare this section.

General management needed for crops is suggested in this section. The system of land capability classification used by the Soil Conservation Service is explained, and the estimated yields of the main crops commonly grown are listed for each soil.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under "Detailed Soil Map Units." Specific information can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

Yields Per Acre

Low precipitation during the growing season limits crop production to areas authorized to obtain irrigation water from local water storage reservoirs.

The average yields per acre that can be expected of the principal crops under a high level of management are given in table 3. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors. The land capability classification of each map unit also is shown in the table.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations also are considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green manure crops; and harvesting that ensures the smallest possible loss.

For yields of irrigated crops, it is assumed that the irrigation system is adapted to the soils and to the crops grown, that good-quality irrigation water is uniformly applied as needed, and that tillage is kept to a minimum.

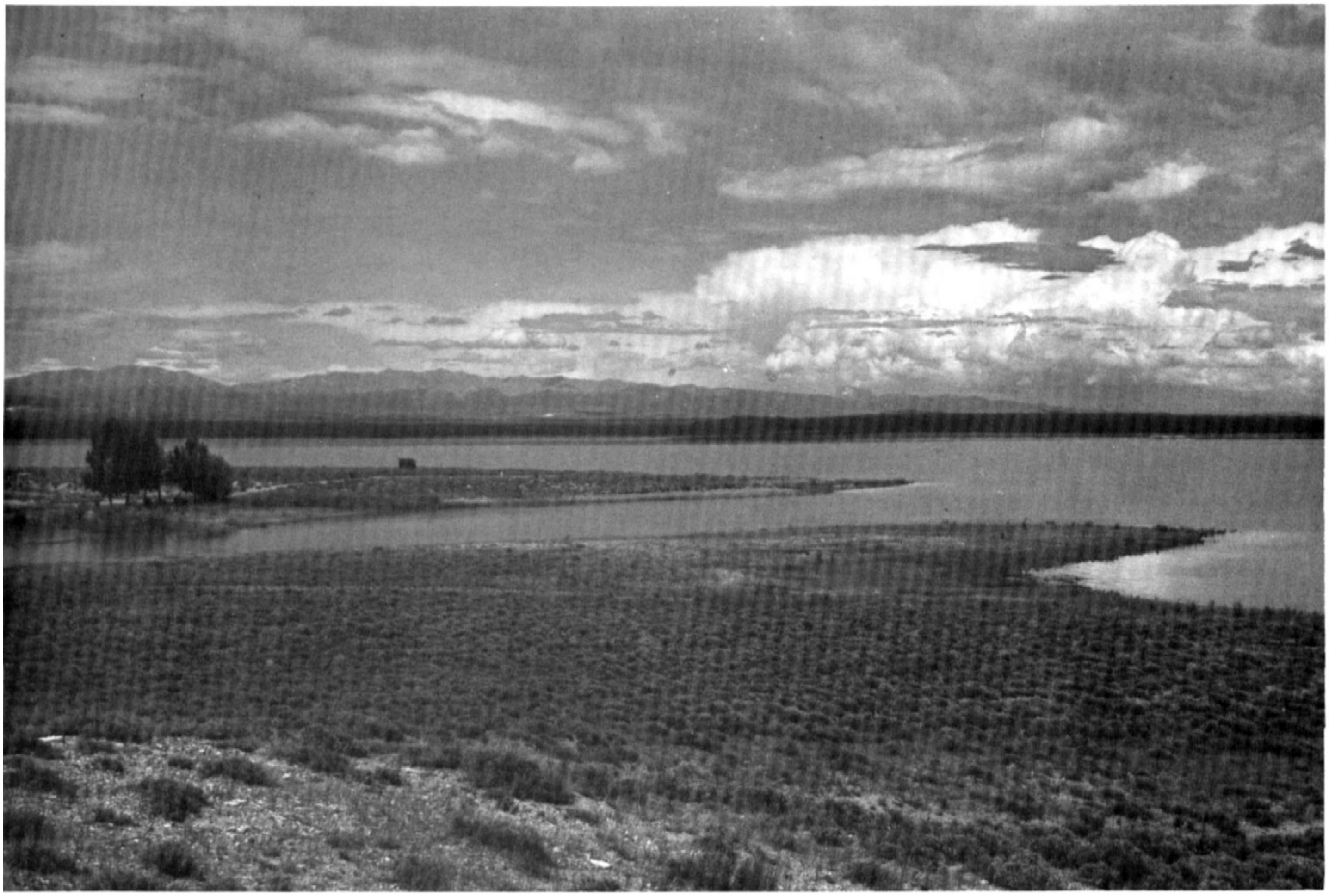

Figure 6.—The Big Sandy Reservoir, the main storage facility for the Eden Valley Irrigation Project.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 3 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Soil Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils for those crops.

Irrigation Water Management

Duane Klamm, state conservation engineer, Soil Conservation Service, helped prepare this section.

About 18,000 acres in the survey area is irrigated farmland. Of this, about 2,500 acres is idle land in any given year. Because only 7 to 8 inches of precipitation can be expected annually, irrigation is essential in cropped areas.

The major crops currently grown are grass hay, alfalfa hay, and small grain. Some of the hay is fed to cattle in the survey area, but most of it is sold and transported out of the valley.

The primary sources of irrigation water are the Big Sandy River and Little Sandy Creek. The water is stored in the Big Sandy Reservoir and the Eden Reservoir and is then released to the survey area (fig. 6).

The irrigation efficiency of the survey area, or the percent of the water released from the reservoir that actually reaches and benefits the plants, is only 29 percent. This low efficiency results in excess deep percolation of irrigation water, which picks up soluble salts from the underlying shale. The water that returns to the Big Sandy River in areas below the survey area is highly saline. Each year approximately 150,000 tons of salt enter the Colorado River System from the Big Sandy River. As a result, the Big Sandy River Unit in Wyoming, which encompasses this survey area, is one of the diffused source control areas mentioned in the Colorado River Basin Salinity Control Act (Public Law 93-320), Title II, Section 203. The low irrigation efficiency limits the number of irrigated acres that can be developed.

The present irrigation method is a distribution system of earthen canals and laterals. The system developed for farms generally consists of earthen field ditches and border dike irrigation. About 1,500 acres in the Eden area, however, is subirrigated. The soils are very deep and have a high rate of water infiltration and a limited available water capacity. The irrigation project was designed for large stream flows (as much as 6 cubic feet per second) in each border and set times of less than 1 hour. This method requires intensive labor and is used only during the day. Irrigation systems that divide the stream flow into multiple borders and are allowed to run for all-night sets have resulted in much of the excessive deep percolation and low irrigation efficiency on most farms.

In the past few years, approximately 800 acres of irrigated land has been converted to low-pressure sprinkler irrigation, such as center pivots and side roll sprinklers. Generally, these systems increase the irrigation efficiency 60 to 70 percent and reduce the amount of water deeply percolated below the root zone and into the underlying shale. If properly designed, sprinkler systems can apply water with minimal labor requirements.

The Soil Conservation Service completed the Colorado River Basin Salinity Control Study for the Big Sandy River and published a report in November 1980. The report identifies various practices that increase the irrigation efficiency and reduce the amount of salt that enters the river. Since the report was published, the Soil Conservation Service has evaluated the conversion to low-pressure sprinkler irrigation for the survey area. This alternative has been supported by local landowners and the state of Wyoming.

A high level of irrigation management is needed to increase irrigation efficiency and reduce salinity. Well designed irrigation systems that account for the depth to bedrock, the available water capacity, and the rate of water intake are needed. Good technical information is needed if landowners are to schedule irrigation throughout the growing season. Checking during the irrigation season to ensure a proper balance between crop use and the amount of available water can maximize crop production. Also, applications of fertilizer can increase yields. The kinds and amounts of fertilizer needed depend on the kinds of soil, the minerals in the soil, and the crops to be grown. Soil tests can help to indicate the kinds and amounts needed.

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops *(5)*. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The criteria used in grouping the soils do not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland, for woodland, and for engineering purposes.

In the capability system, soils are generally grouped at three levels: capability class, subclass, and unit. Only class and subclass are used in this survey.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have few limitations that restrict their use.

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

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

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

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

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

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

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, IVe. The letter *e* shows that the main hazard is the risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w, s,* or *c* because the soils in class V are subject to little or no erosion. They have other limitations that restrict their use to pasture, rangeland, woodland, wildlife habitat, or recreation.

The capability classification of each map unit is given in the section "Detailed Soil Map Units" and in the yields table.

Rangeland

William Christensen, range conservationist, Soil Conservation Service, helped prepare this section.

About 70 percent of the survey area is rangeland. Cow-calf operations are dominant.

In areas that have similar climate and topography, differences in the kind and amount of vegetation produced on rangeland are closely related to the kind of soil. Effective management is based on the relationship between the soils and vegetation and water.

Rangeland is land on which the potential plant community is predominantly native grasses, grasslike plants, forbs, and shrubs suitable for grazing or browsing. In addition to providing food for livestock and wildlife, it also provides cover for animals, provides recreation, and has esthetic value.

In the section "Detailed Soil Map Units," the major grasses, grasslike plants, forbs, and shrubs that make up the potential natural plant community are indicated for the map units used as rangeland. The name of the range site also is given for these map units.

A range site is a distinctive kind of rangeland that produces a characteristic natural plant community that differs from natural plant communities on other range sites in kind, amount, and proportion of range plants. The relationship between soils and vegetation was ascertained during this survey; thus, range sites generally can be determined directly from the soil map. Soil properties that affect moisture supply and plant nutrients have the greatest influence on the productivity of range plants. Soil reaction, salt content, and a seasonal water table also are important.

Range management requires a knowledge of the kinds of soil and of the potential natural plant community. It also requires an evaluation of the present range condition. Range condition is determined by comparing the present plant community with the potential natural plant community on a particular range site. The more closely the existing community resembles the potential community, the better the range condition. Range condition is an ecological rating only.

The objective in range management is to control grazing so that the plants growing on a site are about the same in kind and amount as the potential natural plant community for that site. Such management generally results in the optimum production of vegetation, control of undesirable brush species, conservation of water, and control of erosion. Sometimes, however, a range condition somewhat below the potential meets grazing needs, provides wildlife habitat, and protects soil and water resources.

The basic soil and plant resources can be maintained or improved through good management. Two of the more common management practices are proper grazing use and planned grazing systems, which include deferred grazing and a proper season of use in combination with a good distribution of grazing. A uniform distribution of grazing can be achieved by properly located watering facilities and fences. The suitability of range improvement practices, such as brush management, depends on the vegetative and soil characteristics of the site.

Windbreaks and Environmental Plantings

Windbreaks protect livestock, buildings, and yards from wind and snow. They also protect fruit trees and gardens, and they furnish habitat for wildlife. Several rows of low- and high-growing broadleaf and coniferous trees and shrubs provide the most protection.

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

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

Table 4 shows the height that selected trees and shrubs are expected to reach, when given adequate care, in 20 years on various soil groups. At the end of each description under the heading "Detailed Soil Map Units," the soil has been assigned to one of these windbreak suitability groups. The groups are based primarily on the suitability of the soil for the locally adapted species, as indicated by their growth and vigor. The suitability groups are described in the following paragraphs.

Windbreak suitability group 1K.—The soils in this group are loamy, have a clay content of less than 35 percent, and are frequently flooded by runoff or have a seasonal high water table. In the upper 12 inches, these soils have free carbonates, a pH of 7.8 to 9.0, or an electrical conductivity of less than 4 millimhos per centimeter. They are suited to farmstead, feedlot, and field windbreaks. Spring planting may be delayed for a short period by wetness. Plant competition from weeds and grasses is a primary management concern. The free carbonates, high pH, and slight electrical conductivity limit the selection and growth of trees and shrubs.

Windbreak suitability group 6G.—The soils in this group are loamy-skeletal and sandy-skeletal and are moderately well drained to excessively drained. The available water capacity to a depth of about 60 inches is 2.0 to 2.5 inches. The soils are suited to farmstead, feedlot, and field windbreaks. Plant competition from weeds and grasses is a primary management concern. The low available water capacity limits the selection and growth of trees and shrubs.

Windbreak suitability group 6R.—The soils in this group are moderately deep over bedrock. The available water capacity is 2 inches or more. The soils are suited to farmstead, feedlot, and field windbreaks. The low or moderate available water capacity limits the selection and growth of trees and shrubs. Plant competition from weeds and grasses is a primary management concern.

Windbreak suitability group 7.—The soils in this group are deep and are sandy throughout. They are poorly suited to farmstead, feedlot, and field windbreaks. A low or moderate available water capacity limits the selection and growth of trees and shrubs. Soil blowing at or near the planting site can adversely affect the health and vigor of the trees and shrubs. Optimum growth and survival are not expected.

Windbreak suitability group 8.—The soils in this group are loamy and are moderately well drained or well drained. The available water capacity to a depth of about 60 inches is more than 7.5 inches. In the upper 12 inches, these soils have free carbonates, a pH of 7.8 to 9.0, or an electrical conductivity of less than 4 millimhos per centimeter. They are suited to farmstead, feedlot, and field windbreaks. The free carbonates and high pH limit the selection and growth of trees and shrubs. Plant competition from weeds and grasses is a primary management concern.

Windbreak suitability group 9G.—The soils in this group are deep and have a seasonal high water table within a depth of 5 feet. Some areas are subject to flooding or ponding. In the upper 12 inches, these soils have a pH of more than 7.8 and an electrical conductivity of 4 to 16 millimhos per centimeter. They are suited to farmstead, feedlot, and field windbreaks. The high pH and low or moderate electrical conductivity limit the selection and growth of trees and shrubs. Plant competition from weeds and grasses is a primary management concern. Spring planting may be delayed for a short period by wetness.

Windbreak suitability group 9N.—The soils in this group are deep and have a pH of more than 7.8 and an electrical conductivity of 4 to 16 millimhos per centimeter. They are suited to farmstead, feedlot, and field windbreaks. The high pH and plant competition from weeds and grasses are primary management concerns.

Windbreak suitability group 10.—The soils in this group have one or more characteristics that severely limit the planting, survival, or growth of trees and shrubs. Examples are shallow and very shallow soils, soils with a very low available water capacity, poorly drained and very poorly drained soils that are saturated or ponded throughout the growing season, and toxic soils. The soils are generally not suited to farmstead, feedlot, or field windbreaks. Onsite investigation, however, may indicate that some trees and shrubs can be planted if the site is specially prepared. The selection of species should be tailored to the soil conditions of the site.

The suitability groups can be used as a guide in planning windbreaks and screens. Additional information on planning windbreaks and screens and planting and caring for trees and shrubs can be obtained from local offices of the Soil Conservation Service or the Cooperative Extension Service or from a nursery.

Wildlife Habitat

Richard C. Rintamaki, biologist, Soil Conservation Service, helped prepare this section.

Soils influence wildlife populations primarily through the kinds of habitat they produce. Studies dating back to the 1940's show that wildlife populations are directly related to soil fertility. The abundant populations encountered by early settlers and planners were on the best soils in a given ecological zone. The wildlife population generally is a function of the biotic potential of the soil. The quantity and quality of most vegetative wildlife habitat elements will not exceed the capability of the soil resources unless they are artificially supplied through intensive management systems.

Most kinds of wildlife habitat can be created, improved, or maintained by planting suitable vegetation, maintaining the existing vegetation, promoting the natural establishment of desired plants, or a combination of these. The behavior of soils can be predicted from knowledge of their properties. The growth habits and characteristics of the plants that make up wildlife habitat are affected by such behavior. The suitability of a site for various kinds of wildlife habitat can be ascertained through evaluations of these habitat elements.

The descriptions under the heading "General Soil Map Units" indicate the representative wildlife species that inhabit areas of the map units. The information about big game seasonal habitats was taken from the herd unit maps produced by the Game Division, Wyoming Game and Fish Department. The American peregrine falcon, the bald eagle, and the black-footed ferret are endangered species known to have inhabited the survey area.

The information in this survey about the suitability of the soils for irrigated and nonirrigated cultivated crops, native range, and windbreaks can be useful in managing wildlife habitat. Information about the existing and potential plant communities can enable the user who has data on wildlife habitat requirements to select sites for wildlife habitat and to determine the intensity of plant community management needed to produce satisfactory results.

Engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. The ratings are given in the following tables: Building site development, Sanitary facilities, Construction materials, and Water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil Properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations need to be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 or 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, the shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to (1) evaluate the potential of areas for residential, commercial, industrial, and recreation uses; (2) make preliminary estimates of construction conditions; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; (5) plan detailed onsite investigations of soils and geology; (6) locate potential sources of gravel, sand, earthfill, and topsoil; (7) plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and (8) predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey, can be used to make additional interpretations.

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

Building Site Development

Table 5 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, and local roads and streets. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and depth to the water table.

Dwellings and *small commercial buildings* are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, the shrink-swell potential, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 or 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material, a base of gravel, crushed rock, or stabilized soil material, and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. The depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), the shrink-swell potential, frost action potential, and depth to a high water table affect the traffic-supporting capacity.

Sanitary Facilities

Table 6 shows the degree and the kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and trench sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to filter the effluent effectively. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 6 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage resulting from rapid permeability in the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Trench sanitary landfills are areas where solid waste is disposed of by burying it in soil. The waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site.

Soil in the area of a landfill must be able to bear heavy vehicular traffic. There is a risk of ground water pollution. Ease of excavation and revegetation needs to be considered.

The ratings in table 6 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, flooding, texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Construction Materials

Table 7 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a *probable* or *improbable* source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and the shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, a low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have a moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet, and the depth to the water table is less than 1 foot. These soils may have layers of suitable material, but the material is less than 3 feet thick.

Sand and gravel are natural aggregates suitable for commercial use with a minimum of processing. Sand and gravel are used in many kinds of construction. Specifications for each use vary widely. In table 7, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a *probable* source has a layer of clean sand or gravel or a layer of sand or gravel that is as much as 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an *improbable* source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

Water Management

Table 8 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas and for embankments, dikes, and levees. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage and irrigation.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability in the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and potential frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, or sulfur. Availability of drainage outlets is not considered in the ratings.

Irrigation is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected by large stones and depth to bedrock or to a cemented pan. The performance of a system is affected by the depth of the root zone, the amount of salts or sodium, and soil reaction.

Soil Properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features listed in tables are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classification, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

Engineering Index Properties

Table 9 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under "Soil Series and Their Morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as 15 percent, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the system adopted by the American Association of State Highway and Transportation Officials *(1)* and the Unified soil classification system *(2)*. Both systems are described in the *PCA Soil Primer (3)*.

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, SP-SM.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

Rock fragments larger than 3 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074

millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index are rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

Physical and Chemical Properties

Table 10 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under "Soil Series and Their Morphology."

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated content of clay in each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, and plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earth-moving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 1/3 bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In this table, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems, septic tank absorption fields, and construction where the rate of water movement under saturated conditions affects behavior.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

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

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The change is based on the soil fraction less than 2 millimeters in diameter. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, greater than 9 percent, is sometimes used.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, very fine sand, sand, and organic matter (up to 4 percent) and on soil structure and permeability. The estimates are modified by the presence of rock fragments. Values of K range from 0.02 to 0.69. The higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to wind erosion in cultivated areas. The groups indicate the susceptibility of soil to wind erosion. Soils are grouped according to the following distinctions:

1. Coarse sands, sands, fine sands, and very fine sands. These soils are generally not suitable for crops. They are extremely erodible, and vegetation is difficult to establish.

2. Loamy coarse sands, loamy sands, loamy fine sands, loamy very fine sands, and sapric soil material. These soils are very highly erodible. Crops can be grown if intensive measures to control wind erosion are used.

3. Coarse sandy loams, sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible. Crops can be grown if intensive measures to control wind erosion are used.

4L. Calcareous loams, silt loams, clay loams, and silty clay loams. These soils are erodible. Crops can be grown if intensive measures to control wind erosion are used.

4. Clays, silty clays, noncalcareous clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible. Crops can be grown if measures to control wind erosion are used.

5. Noncalcareous loams and silt loams that are less than 20 percent clay and sandy clay loams, sandy clays, and hemic soil material. These soils are slightly erodible. Crops can be grown if measures to control wind erosion are used.

6. Noncalcareous loams and silt loams that are more than 20 percent clay and noncalcareous clay loams that are less than 35 percent clay. These soils are very slightly erodible. Crops can be grown if ordinary measures to control wind erosion are used.

7. Silts, noncalcareous silty clay loams that are less than 35 percent clay, and fibric soil material. These soils are very slightly erodible. Crops can be grown if ordinary measures to control wind erosion are used.

8. Soils that are not subject to wind erosion because of coarse fragments on the surface or because of surface wetness.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In table 10, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter in a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

Soil and Water Features

Table 11 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the infiltration of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

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

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

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

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

Flooding, the temporary inundation of an area, is caused by overflowing streams or by runoff from adjacent slopes. Water standing for short periods after rainfall or snowmelt is not considered flooding, nor is water in swamps and marshes.

Table 11 gives the frequency and duration of flooding and the time of the year when flooding is most likely.

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 the average, once or less in 2 years; and *frequent* that it occurs, on the average, 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.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and absence of distinctive horizons that form in soils that are not subject to flooding.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The depth to a seasonal high water table applies to undrained soils. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 11 are the depth to the seasonal high water table; the kind of water table—that is, perched or apparent; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in the table. Only saturated zones within a depth of about 6 feet are indicated.

An *apparent* water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. A *perched* water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is specified as either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured clayey soils that have a high water table in winter are the most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors creates a severe corrosion environment. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low*, *moderate*, or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion also is expressed as *low*, *moderate*, or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories *(6)*. Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. Table 12 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Ten soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Inceptisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Aquepts (*Aqu*, meaning water, plus *ept*, from Inceptisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Halaquepts (*Hal*, meaning salty, plus *aquepts*, the suborder of the Inceptisols that has an aquic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Halaquepts.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Generally, the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-loamy, mixed (calcareous), frigid Typic Halaquepts.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the substratum can differ within a series.

Soil Series and Their Morphology

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

Characteristics of the soil and the material in which it formed are identified for each series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the *Soil Survey Manual (4)*. Many of the technical terms used in the descriptions are defined in *Soil Taxonomy (6)*. Unless otherwise stated, matrix colors in the descriptions are for dry soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Detailed Soil Map Units."

Bosler Series

The Bosler series consists of very deep, well drained, moderately permeable soils on alluvial fans, terraces, and valley floors. These soils formed in alluvium. Slopes are 0 to 2 percent.

Typical pedon of Bosler sandy loam, 0 to 1 percent slopes; 2,190 feet east of the center of sec. 15, T. 25 N., R. 106 W.

Ap—0 to 10 inches; grayish brown (10YR 5/2) sandy loam, dark grayish brown (10YR 4/2) moist; weak medium subangular blocky structure; soft, very friable, slightly sticky and nonplastic; mildly alkaline; abrupt smooth boundary.

Bt—10 to 26 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; weak medium subangular blocky structure parting to weak very fine subangular blocky; hard, friable, sticky and plastic; mildly alkaline; clear wavy boundary.

2Ck—26 to 60 inches; light brownish gray (2.5Y 6/2) coarse sand, grayish brown (2.5Y 5/2) moist; single grain; loose; about 5 percent gravel; strongly effervescent; lime disseminated and as coatings on gravel; mildly alkaline.

Depth to the 2C horizon ranges from 20 to 30 inches. The A horizon has value of 5 or 6. The Bt horizon has hue of 2.5Y or 10YR, value of 5 or 6 when dry and 4 or 5 when moist, and chroma of 2 to 4. It is clay loam or loam. It typically has been disturbed by deep tillage. The 2Ck horizon has hue of 5Y, 2.5Y, or 10YR, value of 5 to 7 when dry or moist, and chroma of 2 or 3. It is coarse sand, gravelly sand, loamy sand, loamy fine sand, or gravelly loamy sand.

Clowers Series

The Clowers series consists of very deep, moderately well drained and well drained, moderately permeable soils on alluvial fans and in drainageways. These soils formed in mixed alluvium. Slopes are 0 to 3 percent.

Typical pedon of Clowers loam, in an area of Clowers-Debone-Edlin complex, 0 to 3 percent slopes; 2,540 feet west of the southeast corner of sec. 26, T. 24 N., R. 107 W.

A1—0 to 1 inch; grayish brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) moist; moderate fine granular structure; soft, friable, sticky and plastic; common very fine and fine roots; slightly effervescent; disseminated lime; moderately alkaline; abrupt wavy boundary.

A2—1 to 12 inches; grayish brown (10YR 5/2) loam with ¼-inch lenses and pockets of loamy sand; dark grayish brown (10YR 4/2) moist; weak medium subangular blocky structure; slightly hard, friable, sticky and plastic; many very fine and fine roots; slightly effervescent; disseminated lime; moderately alkaline; gradual smooth boundary.

C1—12 to 28 inches; brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; massive; hard, firm, sticky and plastic; few very fine to medium roots; slightly effervescent; disseminated lime; moderately alkaline; clear wavy boundary.

C2—28 to 60 inches; light yellowish brown (2.5Y 6/4), stratified clay loam and sandy loam, light olive brown (2.5Y 5/4) moist; massive; hard and slightly hard, firm and friable, sticky and slightly sticky, plastic and nonplastic; about 15 percent gravel; slightly effervescent; disseminated lime; moderately alkaline.

The A horizon has value of 5 or 6. The C horizon is moderately alkaline or strongly alkaline. The profile is stratified throughout with loam, sandy loam, clay loam, silty clay loam, or the gravelly analogs of those textures.

Cotopaxi Series

The Cotopaxi series consists of very deep, somewhat excessively drained, rapidly permeable soils on dunes. These soils formed in sandy eolian material. Slopes range from 3 to 20 percent.

Typical pedon of Cotopaxi fine sand, in an area of Vonason-Cotopaxi complex, nearly level and duned; 1,320 feet south of the northwest corner of sec. 29, T. 25 N., R. 105 W.

A—0 to 8 inches; light brownish gray (10YR 6/2) fine sand, dark grayish brown (10YR 4/2) moist; single grain; loose; few very fine and fine roots; mildly alkaline; gradual smooth boundary.

C—8 to 60 inches; pale brown (10YR 6/3) fine sand, brown (10YR 4/3) moist; single grain; loose; few very fine to medium roots; mildly alkaline.

The profile has hue of 2.5Y or 10YR, value of 5 or 6 when dry and 4 or 5 when moist, and chroma of 2 or 3. It is fine sand or loamy fine sand.

Debone Series

The Debone series consists of very deep, well drained and moderately well drained, slowly permeable soils on alluvial fans, stream terraces, and valley floors.

These soils formed in mixed alluvium. Slopes are 0 to 3 percent.

Typical pedon of Debone clay loam, in an area of Clowers-Debone-Edlin complex, 0 to 3 percent slopes; about 1,320 feet east and 660 feet north of the center of sec. 36, T. 26 N., R. 106 W.

E—0 to 2 inches; brown (10YR 5/3) clay loam, dark grayish brown (10YR 4/2) moist; weak thin platy structure; slightly hard, friable, very sticky and plastic; ¼-inch vesicular crust at the surface; about 15 percent pebbles ¼ inch to 2 inches in size; moderately alkaline; abrupt smooth boundary.

Btn1—2 to 5 inches; brown (10YR 5/3) clay, dark brown (10YR 4/3) moist; moderate medium columnar structure parting to strong very fine subangular blocky; hard, friable, very sticky and plastic; common very fine and fine roots; common moderately thick clay films on faces of peds; slightly effervescent; disseminated lime; strongly alkaline; clear wavy boundary.

Btn2—5 to 13 inches; brown (10YR 5/3) clay, dark brown (10YR 4/3) moist; very pale brown (10YR 7/3) ¼-inch pockets of calcium carbonate, pale brown (10YR 6/3) moist; moderate coarse prismatic structure parting to moderate medium subangular blocky; very hard, friable, very sticky and plastic; common very fine and fine roots; common thin clay films on faces of peds; strongly effervescent; lime disseminated and in pockets; very strongly alkaline; 1.8 mmhos conductivity; abrupt wavy boundary.

2C1—13 to 40 inches; light olive brown (2.5Y 5/4) fine sandy loam that has strata of gravelly sandy loam; dark grayish brown (2.5Y 4/2) moist; massive; hard, very friable, slightly sticky and plastic; few roots; slightly effervescent; lime disseminated and as white streaks; strongly alkaline; 3 mmhos conductivity; gradual wavy boundary.

2C2—40 to 60 inches; light olive brown (2.5Y 5/4) fine sandy loam that has strata of gravelly sandy loam; dark grayish brown (2.5Y 4/2) moist; massive; hard, very friable, slightly sticky and plastic; few roots; lime disseminated and as white streaks; moderately alkaline; 3 mmhos conductivity.

The E horizon has hue of 2.5Y or 10YR, value of 5 or 6, and chroma of 2 or 3. The Btn horizon has hue of 2.5Y or 10YR, value of 5 or 6, and chroma of 2 to 4. It is clay or clay loam. The 2C horizon has hue of 5Y to 10YR. It is dominantly sandy loam, gravelly sandy loam, fine sandy loam, or clay loam. Some pedons have coarse sand below a depth of 40 inches.

Debone Variant

The Debone Variant consists of very deep, moderately well drained, slowly permeable soils on alluvial fans, stream terraces, and valley floors. These soils formed in mixed alluvium. Slopes are 0 to 1 percent.

Typical pedon of Debone Variant silty clay loam, in an area of Debone Variant-Shellcreek Variant complex, 0 to 1 percent slopes; 150 feet north of a power line in SW¼SW¼ sec. 9, T. 25 N., R. 105 W.

A—0 to 1 inch; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; strong very fine and fine granular structure; slightly hard, firm, very sticky and very plastic; few very fine roots; slightly effervescent; disseminated lime; strongly alkaline; 1 mmho conductivity; abrupt smooth boundary.

Btn—1 to 4 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; moderate medium columnar structure parting to moderate fine granular in the upper inch and to moderate medium subangular blocky in the remainder; very hard, firm, very sticky and very plastic; common very fine roots; slightly effervescent; disseminated lime; strongly alkaline; 2.5 mmhos conductivity; clear smooth boundary.

C1—4 to 14 inches; grayish brown (2.5Y 5/2) silty clay, olive brown (2.5Y 4/4) moist; weak medium subangular blocky structure; hard, firm, very sticky and very plastic; common very fine roots; white mycelia threads in old root channels; slightly effervescent; disseminated lime; moderately alkaline; 6 mmhos conductivity; gradual wavy boundary.

C2—14 to 60 inches; light olive brown (2.5Y 5/4) silty clay, olive brown (2.5Y 4/4) moist; massive; very hard, firm, very sticky and very plastic; few very fine roots; few white mycelia threads in the upper part; slightly effervescent; disseminated lime; moderately alkaline; 7 mmhos conductivity.

The A horizon has hue of 2.5Y or 10YR, value of 5 or 6 when dry and 3 or 4 when moist, and chroma of 2 or 3. It is mildly alkaline to strongly alkaline. The Btn horizon has hue of 2.5Y or 10YR, value of 5 or 6 when dry and 4 or 5 when moist, and chroma of 2 or 3. It is clay, clay loam, silty clay, or silty clay loam with 35 to 50 percent clay. It is strongly alkaline or very strongly alkaline. The C horizon has hue of 5Y to 10YR. It is clay, silty clay, or clay loam. It is moderately alkaline to very strongly alkaline.

Diamondville Series

The Diamondville series consists of moderately deep, well drained, moderately slowly permeable soils on upland plains. These soils formed in residuum and alluvium. Slopes range from 0 to 6 percent.

Typical pedon of Diamondville sandy loam, in an area of Diamondville-Forelle sandy loams, 0 to 3 percent slopes; in the northwest corner of the NE¼ sec. 5, T. 24 N., R. 106 W.

A—0 to 3 inches; brown (10YR 5/3) sandy loam, dark grayish brown (10YR 4/2) moist; weak fine granular structure; soft, very friable, slightly sticky and slightly plastic; common very fine and fine roots; mildly alkaline; clear smooth boundary.

Bt1—3 to 11 inches; brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; weak coarse prismatic structure parting to moderate medium and fine subangular blocky; hard, friable, sticky and plastic; many thin clay films on faces of peds; common very fine and fine and few medium roots; mildly alkaline; clear wavy boundary.

Bt2—11 to 20 inches; light olive brown (2.5Y 5/4) loam, olive brown (2.5Y 4/4) moist; weak coarse and medium subangular blocky structure; hard, friable, sticky and plastic; common very fine and fine roots; slightly effervescent; lime disseminated and as few small pockets; mildly alkaline; clear wavy boundary.

Bk—20 to 36 inches; light olive gray (5Y 6/2) loam, olive gray (5Y 5/2) moist; massive; slightly hard, friable, sticky and plastic; few roots; strongly effervescent; lime disseminated and as crusts on the underside of pebbles; strongly alkaline; gradual wavy boundary.

Cr—36 inches; soft shale.

The depth to shale ranges from 20 to 40 inches. The A horizon has value of 5 or 6 when dry and 3 or 4 when moist and chroma of 2 or 3. The Bt horizon is clay loam, loam, or sandy clay loam. The Bk horizon has hue of 5Y or 2.5Y, value of 5 to 7 when dry and 4 or 5 when moist, and chroma of 2 to 4. It is sandy loam or clay loam.

Edlin Series

The Edlin series consists of very deep, well drained, moderately rapidly permeable soils on alluvial fans, toe slopes of scarps, and valley floors. These soils formed in alluvium. Slopes range from 0 to 20 percent.

Typical pedon of Edlin fine sandy loam, 1 to 6 percent slopes; 50 feet northwest of the bridge in the center of NE¼SW¼ sec. 27, T. 26 N., R. 106 W.

A—0 to 4 inches; brown (10YR 5/3) fine sandy loam, dark grayish brown (10YR 4/2) moist; weak medium platy structure; soft, very friable, slightly sticky and slightly plastic; common fine and very fine roots; mildly alkaline; clear smooth boundary.

Bw—4 to 11 inches; brown (10YR 5/3) fine sandy loam, dark brown (10YR 4/3) moist; weak coarse prismatic structure parting to weak and moderate coarse and medium subangular blocky; soft, very friable, slightly sticky and slightly plastic; common fine and very fine roots; mildly alkaline; gradual smooth boundary.

Bk—11 to 30 inches; pale brown (10YR 6/3) fine sandy loam, brown (10YR 5/3) moist; weak medium subangular blocky structure; hard, very friable, slightly sticky and slightly plastic; few very fine to medium roots; strongly effervescent; lime disseminated and as thin coatings on a few pebbles; mildly alkaline; gradual wavy boundary.

C—30 to 60 inches; pale brown (10YR 6/3) fine sandy loam, light olive brown (2.5Y 5/4) moist; massive; soft, very friable, slightly sticky and slightly plastic; strongly effervescent; authigenic disseminated lime; mildly alkaline.

The A horizon has hue of 10YR or 2.5Y, value of 5 or 6 when dry and 3 to 5 when moist, and chroma of 2 or 3. The Bw horizon has value of 5 or 6 when dry and 4 or 5 when moist and chroma of 2 to 4. It is fine sandy loam or sandy loam. The Bk horizon has value of 5 to 7 when dry or moist and chroma of 2 to 4. It is fine sandy loam or sandy loam. The C horizon has value of 5 or 6 when dry and 4 or 5 when moist and chroma of 2 to 4. It is loamy sand, fine sandy loam, sandy loam, or loam.

Elk Mountain Series

The Elk Mountain series consists of moderately deep, well drained, moderately rapidly permeable soils on upland plains and valley floors. These soils formed in residuum and alluvium. Slopes range from 0 to 6 percent.

Typical pedon of Elk Mountain sandy loam, 0 to 1 percent slopes; NE¼SW¼ sec. 32, T. 25 N., R. 106 W.

A—0 to 3 inches; grayish brown (10YR 5/2) sandy loam, dark grayish brown (10YR 4/2) moist; moderate fine granular structure; soft, very friable, slightly sticky and slightly plastic; common very fine and fine roots; mildly alkaline; clear smooth boundary.

Bt1—3 to 11 inches; brown (10YR 5/3) loam, dark brown (10YR 4/3) moist; weak coarse prismatic structure parting to moderate medium subangular blocky; slightly hard, very friable, sticky and plastic; common very fine and fine roots; many thin clay films on faces of peds; moderately alkaline; clear smooth boundary.

Bt2—11 to 24 inches; light olive brown (2.5Y 5/4) gravelly sandy loam, olive brown (2.5Y 4/4) moist; moderate medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; few very fine and fine roots; many thin clay films on faces of peds; about 15 percent gravel; moderately alkaline; clear smooth boundary.

Bk—24 to 30 inches; light olive brown (2.5Y 5/4) gravelly sandy loam, olive brown (2.5Y 4/4) moist; massive; soft, very friable, slightly sticky and slightly plastic; few roots; about 15 percent gravel; strongly effervescent; lime disseminated and as coatings on gravel; moderately alkaline; clear smooth boundary.

2C—30 to 35 inches; pale olive (5Y 6/3) channery loam, olive (5Y 5/3) moist; massive; soft, friable, slightly sticky, slightly plastic; few roots; about 20 percent channers; strongly effervescent; mildly alkaline; gradual wavy boundary.

2Cr—35 inches; soft shale.

The depth to bedrock ranges from 20 to 40 inches. The Bt horizon is loam, sandy loam, gravelly sandy loam, or fine sandy loam. The Bk horizon is gravelly sandy loam, sandy loam, or fine sandy loam. The content of rock fragments ranges from 0 to 35 percent in the B horizon.

Farson Series

The Farson series consists of very deep and deep, well drained and moderately well drained, moderately rapidly permeable soils on fan aprons and valley floors. These soils formed in stratified alluvium (fig. 7). Slopes range from 0 to 10 percent.

Typical pedon of Farson sandy loam, 0 to 1 percent slopes; 900 feet east and 100 feet north of the southwest corner of sec. 18, T. 25 N., R. 105 W.

Ap—0 to 8 inches; brown (10YR 5/3) sandy loam, dark grayish brown (10YR 4/2) moist; weak medium subangular blocky structure; soft, very friable, slightly sticky and nonplastic; common fine and very

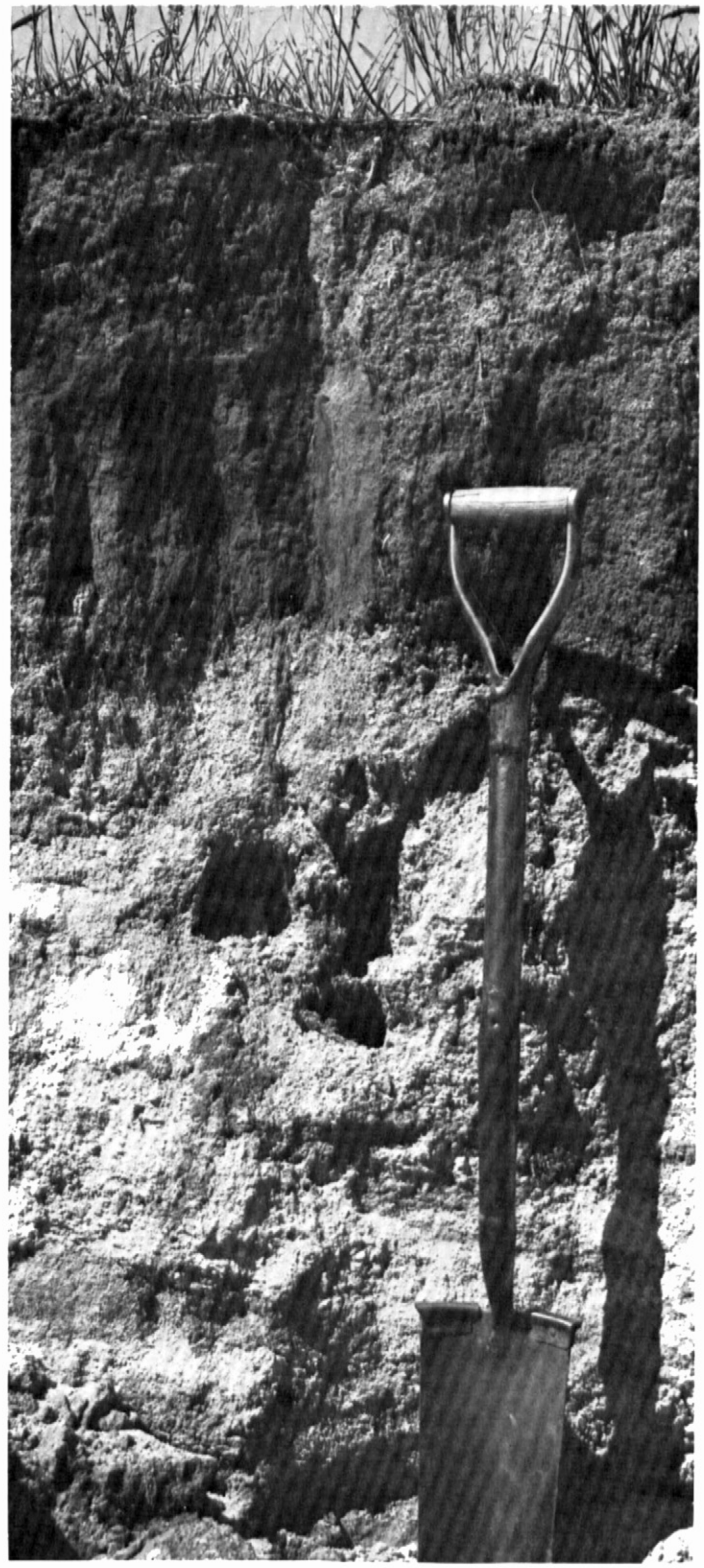

Figure 7.—Profile of Farson sandy loam, 0 to 1 percent slopes.

fine roots; mildly alkaline; abrupt smooth boundary.

Bt—8 to 17 inches; brown (10YR 5/3) sandy loam, dark brown (10YR 4/3) moist; moderate coarse prismatic structure parting to weak medium subangular blocky; hard, friable, sticky and slightly plastic; common very fine and fine roots; common thin clay films on faces of peds; mildly alkaline; clear wavy boundary.

Bk1—17 to 19 inches; pale brown (10YR 6/3) gravelly sandy loam, brown (10YR 4/3) moist; moderate medium prismatic structure parting to weak medium subangular blocky; hard, very friable, slightly sticky and nonplastic; common fine and very fine roots; strongly effervescent; about 8 percent calcium carbonate equivalent; lime disseminated and as few soft masses; about 20 percent fine gravel; mildly alkaline; clear wavy boundary.

2Bk2—19 to 42 inches; light brownish gray (2.5Y 6/2) gravelly sand stratified with thin lenses of pale brown gravelly loamy fine sand ¼ inch to 3 inches thick; grayish brown (2.5Y 5/2) moist; single grain; loose; few fine and very fine roots; slightly effervescent; about 10 percent calcium carbonate equivalent; lime disseminated and as few soft masses; about 20 percent gravel; mildly alkaline; abrupt wavy boundary.

3C—42 to 60 inches; light brownish gray (2.5Y 6/2) coarse sand, olive gray (5Y 5/2) moist; single grain; loose; slightly effervescent; disseminated lime; mildly alkaline.

The A horizon has hue of 10YR or 2.5Y, value of 4 to 6 when dry and 3 or 4 when moist, and chroma of 2 or 3. It is neutral or mildly alkaline. The Bt horizon has hue of 7.5YR to 2.5Y, value of 4 to 6 when dry and 3 to 5 when moist, and chroma of 2 to 4. It is sandy loam, gravelly sandy loam, or fine sandy loam. It is neutral or mildly alkaline. The Bk horizon has hue of 10YR or 2.5Y, value of 5 to 7 when dry and 4 or 5 when moist, and chroma of 2 to 4. It is sandy loam, gravelly sandy loam, or fine sandy loam. It is mildly alkaline or moderately alkaline. The 2Bk and 3C horizons have hue of 10YR or 2.5Y, value of 5 to 7 when dry and 5 or 6 when moist, and chroma of 2 to 4. They are loamy sand, sand, loamy coarse sand, or gravelly sand. They are mildly alkaline or moderately alkaline.

Bedrock is at a depth of 40 to more than 60 inches.

Farson Variant

The Farson Variant consists of very deep, moderately well drained, moderately permeable, moderately saline soils on valley floors. These soils formed in mixed alluvium. Slopes are 0 to 1 percent.

Typical pedon of Farson Variant gravelly sandy loam, 0 to 1 percent slopes; 1,200 feet south and 500 feet west of the northeast corner of sec. 23, T. 23 N., R. 106 W.

Ap—0 to 7 inches; brown (10YR 5/3) gravelly sandy loam, dark brown (10YR 4/3) moist; weak medium and fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine roots; about 20 percent gravel; slightly effervescent; disseminated lime; moderately alkaline; 2 mmhos conductivity; ⅛-inch white salt crust on surface that is strongly alkaline and has 14 mmhos conductivity; clear smooth boundary.

Bt—7 to 18 inches; brown (10YR 5/3) gravelly sandy loam, dark brown (10YR 4/3) moist; moderate coarse prismatic structure parting to weak medium subangular blocky; slightly hard, friable, sticky and slightly plastic; common very fine and fine roots; about 20 percent gravel; slightly effervescent; disseminated lime; moderately alkaline; gradual smooth boundary.

2C—18 to 24 inches; pale brown (10YR 6/3) coarse sand, dark brown (10YR 4/3) moist; single grain; loose; about 5 percent pebbles; slightly effervescent; disseminated lime; moderately alkaline; clear smooth boundary.

2Ck1—24 to 28 inches; light yellowish brown (2.5Y 6/4) gravelly sand, olive brown (2.5Y 4/4) moist; single grain; loose; about 25 percent pebbles; strongly effervescent; lime disseminated and as thin crusts on the underside of pebbles; moderately alkaline; clear smooth boundary.

2Ck2—28 to 33 inches; light gray (2.5Y 7/2) gravelly loamy sand, grayish brown (2.5Y 5/2) moist; single grain; loose; about 20 percent pebbles; strongly effervescent; disseminated lime; mildly alkaline; clear smooth boundary.

2C'—33 to 60 inches; pale brown (10YR 6/3) coarse sand, brown (10YR 5/3) moist; single grain; loose; strongly effervescent; mildly alkaline.

The white salt crust or coating on the surface is intermittent. Salinity of the surface horizon is slight or moderate, and alkalinity is moderate or strong. The depth to contrasting coarse textured material is mainly 10 to 20 inches. The content of gravel in the A and B horizons is generally 15 to 25 percent. The A horizon has value of 5 or 6 when dry and 3 or 4 when moist and chroma of 2 or 3. The Bt horizon is sandy loam or gravelly sandy loam. It has the same color range as the A horizon. The 2C horizon is coarse sand, loamy sand, or the gravelly analogs of those textures. The content of gravel in this horizon ranges from 0 to 35 percent.

Forelle Series

The Forelle series consists of very deep, well drained, moderately permeable soils on alluvial fans and upland plains. These soils formed in alluvium and residuum. Slopes range from 0 to 6 percent.

Typical pedon of Forelle sandy loam, in an area of Forelle-Diamondville sandy loams, 3 to 6 percent slopes; 400 feet south and 200 feet west of the northeast corner of sec. 17, T. 24 N., R. 106 W.

A—0 to 3 inches; brown (10YR 5/3) sandy loam, dark brown (10YR 4/3) moist; weak medium platy structure parting to weak fine granular; soft, very friable, slightly sticky and nonplastic; many very fine and fine roots; mildly alkaline; clear smooth boundary.

Bt1—3 to 11 inches; yellowish brown (10YR 5/4) loam, dark yellowish brown (10YR 4/4) moist; moderate coarse prismatic structure parting to weak medium subangular blocky; slightly hard, friable, sticky and plastic; many thin clay films on faces of peds; common very fine and fine roots; mildly alkaline; clear wavy boundary.

Bt2—11 to 22 inches; pale brown (10YR 6/3) loam, light olive brown (2.5Y 5/4) moist; moderate coarse prismatic structure parting to weak medium subangular blocky; slightly hard, friable, sticky and plastic; many moderately thick clay films on faces of peds; few very fine and fine roots; mildly alkaline; gradual wavy boundary.

Bk—22 to 60 inches; variegated grayish brown (2.5Y 5/2) and light yellowish brown (2.5Y 6/4) sandy loam, olive brown (2.5Y 4/4), gray (5Y 5/1), and yellowish brown (10YR 5/6) moist; massive; soft, very friable, slightly sticky and nonplastic; few roots; slightly effervescent; lime disseminated and as thin coatings on channers; about 5 percent channery sandstone fragments less than 1 inch in size; moderately alkaline.

The depth to effervescent material ranges from 12 to 26 inches. The A horizon has hue of 2.5Y or 10YR, value of 5 or 6 when dry, and chroma of 2 or 3. The Bt horizon has hue of 2.5Y or 10YR, value of 5 or 6 when dry, and chroma of 3 or 4. It is loam or clay loam. The Bk horizon has hue of 5Y to 10YR. It is dominantly loam, sandy loam, or sandy clay loam. In some pedons, however, it is loamy sand below a depth of 50 inches. It is mildly alkaline or moderately alkaline.

Gunbarrel Series

The Gunbarrel series consists of very deep, somewhat poorly drained, rapidly permeable soils formed in mixed alluvium in slight depressions and swales on valley floors. These soils formed in mixed alluvium. Slopes are 0 to 1 percent.

Typical pedon of Gunbarrel loamy sand, 0 to 1 percent slopes; 800 feet north and 50 feet west of the southeast corner of sec. 35, T. 25 N., R. 106 W.

A—0 to 2 inches; light brownish gray (10YR 6/2) loamy sand, grayish brown (2.5Y 5/2) moist; massive; soft, very friable, nonsticky and nonplastic; strongly effervescent; disseminated lime; strongly alkaline; 4 mmhos conductivity; 13 mmhos conductivity in a ½-inch crust at the surface; many very fine to medium roots; gradual wavy boundary.

C—2 to 16 inches; grayish brown (10YR 5/2) loamy sand, dark gray (10YR 4/1) moist with common fine distinct dark yellowish brown (10YR 3/4) mottles; massive; soft, very friable, nonsticky and nonplastic; slightly effervescent; disseminated lime; moderately alkaline; common very fine and fine roots; gradual wavy boundary.

Cg—16 to 60 inches; light gray (5Y 6/1) loamy sand, gray (5Y 5/1) moist with common fine faint light olive brown (2.5Y 5/4) mottles; massive; soft, very friable, nonsticky and nonplastic; strongly effervescent; disseminated lime; moderately alkaline.

A saline-sodic crust ⅛ to ¾ inch thick is at the surface in most pedons. The A horizon has hue of 10YR or 2.5Y, value of 5 or 6 when dry and 3 to 5 when moist, and chroma of 2 or 3. It is moderately alkaline to very strongly alkaline. Conductivity ranges from 2 to 80 mmhos in this horizon. The C horizon has hue of 10YR or 2.5Y. The Cg horizon has hue of 5Y or 5GY. It is loamy sand, sand, or gravelly sand.

Haterton Series

The Haterton series consists of shallow and very shallow, well drained and excessively drained, moderately permeable soils formed in shale residuum on upland scarps, knolls, and ridges. Slopes range from 1 to 30 percent.

Typical pedon of Haterton loam, in an area of Haterton, thin solum-Haterton complex, 10 to 30 percent slopes; 2,340 feet south and 100 feet west of the northeast corner of sec. 12, T. 24 N., R. 107 W.

A1—0 to 1 inch; brown (10YR 5/3) loam, dark brown (10YR 4/3) moist; weak very fine granular structure; soft, friable, sticky and plastic; slightly effervescent; disseminated lime; moderately alkaline; clear smooth boundary.

A2—1 to 6 inches; brown (10YR 5/3) loam, dark brown (10YR 4/3) moist; weak medium subangular blocky structure; soft, friable, sticky and plastic; common very fine and fine roots; slightly effervescent; disseminated lime; moderately alkaline; clear wavy boundary.

C—6 to 16 inches; very pale brown (10YR 7/3) channery loam, brown (10YR 5/3) moist; massive; soft, friable, slightly sticky and plastic; common very fine and fine roots; about 20 percent channers ¼ inch to 4 inches in size; strongly effervescent; disseminated lime; strongly alkaline; gradual wavy boundary.

Cr—16 inches; soft shale.

The depth to bedrock ranges from 3 to 20 inches. The content of rock fragments ranges from 0 to 35 percent throughout the profile. These fragments are mainly shale channers ¼ inch to 3 inches in size, but some areas have a lag of rounded stream gravel on and below the surface. The soils have hue of 2.5Y or 10YR, value of 5 to 7 when dry and 4 or 5 when moist, and chroma of 2 to 4. They are moderately alkaline or strongly alkaline.

Hooper Series

The Hooper series consists of very deep, moderately well drained, very slowly permeable soils on low terraces and valley floors. These soils formed in mixed alluvium. Slopes are 0 to 2 percent.

Typical pedon of Hooper clay loam, in an area of Hooper-Hooper, overblown, complex, 0 to 1 percent slopes; 1,800 feet east and 20 feet north of the southwest corner of sec. 26, T. 24 N., R. 106 W.

E—0 to 2 inches; light brownish gray (10YR 6/2) clay loam, dark brown (10YR 4/3) moist; moderate medium platy structure; a ½-inch vesicular crust at the surface; slightly hard, friable, sticky and plastic; slightly effervescent; disseminated lime; strongly alkaline; abrupt wavy boundary.

Btn1—2 to 5 inches; brown (10YR 5/3) clay, dark brown (10YR 4/3) moist; strong medium columnar structure parting to moderate fine and very fine subangular blocky; hard, friable, very sticky and plastic; thin continuous clay films on faces of peds; common very fine to medium roots; slightly effervescent; disseminated lime; very strongly alkaline; clear wavy boundary.

Btn2—5 to 18 inches; pale brown (10YR 6/3) clay loam, dark yellowish brown (10YR 4/4) moist; hard, friable, very sticky and plastic; few white mycelia threads; few very fine to medium roots; strongly effervescent; disseminated lime; very strongly alkaline; clear wavy boundary.

C1—18 to 28 inches; brown (10YR 5/3) sandy clay loam, dark yellowish brown (10YR 4/4) moist; massive; slightly hard, friable, sticky and plastic; few very fine roots; slightly effervescent; disseminated lime; strongly alkaline; clear wavy boundary.

2C2—28 to 60 inches; light brownish gray (2.5Y 6/2) gravelly sand, grayish brown (2.5Y 5/2) moist; single grain; loose; about 20 percent pebbles; slightly effervescent; disseminated lime; strongly alkaline.

The depth to contrasting sand and gravel ranges from 24 to 40 inches. The E horizon has value of 4 or 5 when moist and chroma of 2 or 3. Some pedons have an A horizon rather than an E horizon. The A horizon is loamy fine sand or fine sandy loam 3 to 9 inches thick. The Btn horizon has hue of 10YR or 7.5YR, value of 4 or 5 when moist, and chroma of 3 or 4. It is clay or clay loam. The 2C horizon has hue of 7.5YR to 2.5Y, value of 6 or 7 when dry and 5 or 6 when moist, and chroma of 2 or 3. It is sandy loam, gravelly sand, or sand.

Huguston Series

The Huguston series consists of shallow, well drained, moderately rapidly permeable soils on upland scarps and ridges. These soils formed in sandstone residuum. Slopes range from 6 to 30 percent.

Typical pedon of Huguston sandy loam, in an area of Edlin-Huguston complex, 6 to 30 percent slopes; in the NE¼SW¼ sec. 27, T. 26 N., R. 106 W.

A1—0 to 2 inches; brown (10YR 5/3) sandy loam, dark brown (10YR 4/3) moist; weak fine granular structure; soft, very friable, slightly sticky and slightly plastic; few roots; slightly effervescent; disseminated lime; moderately alkaline; clear smooth boundary.

A2—2 to 5 inches; brown (10YR 5/3) sandy loam, dark brown (10YR 4/3) moist; weak very fine subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; common very fine and fine roots;

slightly effervescent; disseminated lime; moderately alkaline; clear smooth boundary.

C—5 to 15 inches; pale brown (10YR 6/3) sandy loam, brown (10YR 5/3) moist; soft, very friable, nonsticky and nonplastic; few very fine and fine roots; about 30 percent sandstone channers, which can be worked down by hand; strongly effervescent; lime disseminated and as few thin coatings on some channers; moderately alkaline; gradual wavy boundary.

Cr—15 inches; soft sandstone.

The depth to bedrock ranges from 10 to 20 inches. Textures throughout the profile generally are sandy loam or fine sandy loam, but 1- to 5-inch coppice dunes of loamy fine sand are on the surface in areas that have clumps of sagebrush. The content of rock fragments ranges from 0 to 20 percent throughout the profile. These fragments are mostly sandstone channers ¼ inch to 6 inches in size. About half of the rock fragments break down on pretreatment. Reaction is mildly alkaline or moderately alkaline throughout the profile. The C horizon has value of 5 or 6 when dry and 4 or 5 when moist. Chroma is 2 to 4 throughout the profile.

Kandaly Series

The Kandaly series consists of very deep, somewhat excessively drained, rapidly permeable soils on dunes. These soils formed in sandy eolian material. Slopes range from 3 to 20 percent.

Typical pedon of Kandaly fine sand, 3 to 20 percent slopes; in the SE¼NW¼ sec. 25, T. 24 N., R. 106 W.

A—0 to 2 inches; pale brown (10YR 6/3) fine sand, brown (10YR 5/3) moist; single grain; loose; slightly effervescent; disseminated lime; mildly alkaline; clear wavy boundary.

C1—2 to 22 inches; pale brown (10YR 6/3) fine sand, brown (10YR 5/3) moist; single grain; loose; few very fine to medium roots; strongly effervescent; disseminated lime; mildly alkaline; gradual wavy boundary.

C2—22 to 60 inches; very pale brown (10YR 7/3) fine sand, brown (10YR 5/3) moist; single grain; loose; few roots; strongly effervescent; disseminated lime; moderately alkaline.

The entire profile has hue of 2.5Y or 10YR, value of 5 to 7 when dry and 4 or 5 when moist, and chroma of 2 or 3. It is fine sand or loamy fine sand. The lower part of the C horizon is mildly alkaline or moderately alkaline.

Littlebear Series

The Littlebear series consists of very deep, moderately well drained, moderately rapidly permeable soils on valley floors. These soils formed in mixed alluvium. Slopes are 0 to 2 percent.

Typical pedon of Littlebear loamy sand, 0 to 2 percent slopes; in the center of SW¼ sec. 24, T. 24 N., R. 106 W.

A—0 to 2 inches; pale brown (10YR 6/3) loamy sand, dark grayish brown (10YR 4/2) moist; weak fine granular structure; loose, very friable, nonsticky and nonplastic; moderately alkaline; clear smooth boundary.

Bw—2 to 9 inches; brown (10YR 5/4) sandy loam, dark brown (10YR 4/3) moist; weak coarse prismatic structure parting to very weak medium subangular blocky; soft, very friable, slightly sticky and nonplastic; common very fine and fine roots; moderately alkaline; 0.4 mmhos conductivity; gradual smooth boundary.

C1—9 to 15 inches; light gray (10YR 7/2) sandy loam, brown (10YR 5/3) moist; massive; soft, very friable, slightly sticky and nonplastic; common very fine and fine roots; slightly effervescent; disseminated lime; strongly alkaline; 1.5 mmhos conductivity; clear wavy boundary.

C2—15 to 22 inches; very pale brown (10YR 7/3) sandy loam, light olive brown (2.5Y 5/4) moist; massive; soft, very friable, slightly sticky and slightly plastic; few roots; strongly effervescent; disseminated lime; strongly alkaline; 2.6 mmhos conductivity; clear wavy boundary.

C3—22 to 60 inches; very pale brown (10YR 7/3) loamy sand, light olive brown (2.5Y 5/4) moist; massive; loose; slightly effervescent; disseminated lime; moderately alkaline; clear wavy boundary.

A water table is at a depth of 4 to 5 feet during the irrigation season. The soils are slightly saline to moderately saline. The A horizon has value of 5 or 6 when dry and 4 or 5 when moist and chroma of 2 or 3 when dry or moist. The C horizon has hue of 10YR or 2.5Y, value of 6 or 7 when dry and 5 or 6 when moist, and chroma of 2 to 4. It is moderately alkaline or strongly alkaline. It is sandy loam or gravelly sandy loam. The 2C horizon is gravelly loamy sand, gravelly sand, sand, or loamy sand.

Means Series

The Means series consists of moderately deep, well drained, moderately permeable soils on fan aprons, pediment toe slopes, foot slopes, and valley floors. These soils formed in alluvium. Slopes range from 0 to 10 percent.

Typical pedon of Means sandy loam, in an area of Means-Farson sandy loams, 0 to 1 percent slopes; 1,900 feet west of the northeast corner of sec. 15, T. 26 N., R. 105 W.

A—0 to 3 inches; grayish brown (10YR 5/2) sandy loam, dark grayish brown (10YR 4/2) moist; weak coarse platy structure parting to moderate fine granular; slightly hard, very friable, slightly sticky and nonplastic; common very fine and fine roots; mildly alkaline; clear smooth boundary.

Bt—3 to 17 inches; brown (10YR 5/3) sandy loam, dark brown (10YR 4/3) moist; moderate coarse prismatic structure parting to weak medium subangular blocky; hard, friable, slightly sticky and slightly plastic; common very fine to medium roots; many thin clay films on faces of peds; mildly alkaline; gradual smooth boundary.

Bk—17 to 27 inches; brown (10YR 5/3) loamy coarse sand, brown (10YR 4/3) moist; massive; slightly hard, very friable, nonsticky and nonplastic; few fine roots; strongly effervescent; lime disseminated and as common thin coatings on pebbles; about 5 percent calcium carbonate equivalent; about 2 percent fine pebbles; mildly alkaline; gradual smooth boundary.

2C—27 to 38 inches; brown (10YR 5/3) gravelly sand, brown (10YR 4/3) moist; single grain; loose; few fine roots; slightly effervescent; lime disseminated and as few thin coatings on some pebbles; about 3 percent calcium carbonate equivalent; about 25 percent pebbles less than ½ inch in diameter; mildly alkaline; abrupt smooth boundary.

3Cr—38 to 60 inches; soft, olive green shale.

The A horizon has value of 5 or 6 when dry and 3 to 5 when moist and chroma of 3 or 4. The Bt horizon has value of 5 or 6 when dry and 3 to 5 when moist and chroma of 3 or 4. It is sandy loam or fine sandy loam. The Bk and 2C horizons have value of 5 to 7 when dry and 4 to 6 when moist and chroma of 2 to 4. They are gravelly sandy loam, sandy loam, loamy sand, loamy coarse sand, or gravelly sand. They are mildly alkaline or moderately alkaline. Hue is 10YR or 2.5Y throughout the profile.

Means Variant

The Means Variant consists of moderately deep, moderately well drained, moderately permeable soils on valley floors. These soils formed in alluvium. Slope is 0 to 1 percent.

Typical pedon of Means Variant sandy loam, 0 to 1 percent slopes; 2,640 feet south and 2,000 feet west of the northeast corner of sec. 31, T. 26 N., R. 105 W.

A—0 to 2 inches; grayish brown (10YR 5/2) sandy loam, dark brown (10YR 3/3) moist; weak fine granular structure; soft, very friable, slightly sticky and nonplastic; common very fine and fine roots; slightly effervescent; disseminated lime; mildly alkaline; spotty, thin, strongly alkaline, slightly saline or moderately saline, white salt crusts at the surface; clear smooth boundary.

Bt—2 to 13 inches; yellowish brown (10YR 5/4) sandy loam, dark brown (10YR 4/3) moist; weak very coarse prismatic structure parting to weak medium subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; common very fine to medium roots; mildly alkaline; clear smooth boundary.

2Bk—13 to 24 inches; brown (10YR 5/3) loamy coarse sand, brown (10YR 4/3) moist; massive; soft, very friable, nonsticky and nonplastic; few roots; noneffervescent in matrix; several ½- to 2-inch lenses of strongly effervescent, pale brown (10YR 6/3) loamy sand, brown (10YR 5/3) moist; disseminated lime; mildly alkaline; clear smooth boundary.

3C—24 to 39 inches; pale brown (10YR 6/3) gravelly sand, brown (10YR 5/3) moist; single grain; loose; about 20 percent gravel; slightly effervescent; lime disseminated and as few thin coatings on pebbles; mildly alkaline; clear smooth boundary.

4Cr—39 inches; soft sandstone.

The depth to bedrock ranges from 30 to 40 inches. A perched water table is at a depth of about 3 feet or directly above the bedrock during part of the irrigation season. The content of gravel ranges from 0 to 15 percent in the A and B horizons and from 0 to 35 percent in the 2Bk and 3C horizons. The A horizon has value of 5 or 6 when dry and 3 or 4 when moist and chroma of 2 or 3. The Bt horizon has value of 5 or 6 when dry and 3 to 5 when moist and chroma of 3 or 4. The C horizon has hue of 10YR or 2.5Y. It is mildly alkaline or moderately alkaline.

Mishak Series

The Mishak series consists of very deep, somewhat poorly drained and poorly drained, moderately permeable soils on bottom land and in depressions. These soils formed in mixed alluvium. Slopes are 0 to 3 percent.

Typical pedon of Mishak fine sandy loam, in an area of Mishak-Mishak Variant complex, 0 to 3 percent slopes; 1,050 feet west and 400 feet north of the southeast corner of sec. 35, T. 25 N., R. 106 W.

A—0 to 5 inches; pale brown (10YR 6/3) fine sandy loam, brown (10YR 4/3) moist; massive; soft, very friable, nonsticky and nonplastic; ¼-inch, very strongly alkaline salt crust at the surface; few fine faint black and many fine distinct brown mottles; strongly effervescent; disseminated lime; strongly alkaline; clear smooth boundary.

Bg—5 to 9 inches; light gray (5Y 7/1) sandy clay loam, gray (5Y 6/1) moist; moderate very fine and fine granular structure; slightly hard, very friable, sticky and plastic; common fine distinct yellowish brown mottles; common very fine roots; strongly effervescent; disseminated lime; strongly alkaline; clear smooth boundary.

2Cg—9 to 13 inches; olive gray (5Y 5/2) fine sandy loam, greenish gray (5GY 6/1) moist; massive; soft, very friable, slightly sticky and nonplastic; common fine distinct mottles; few roots; strongly effervescent; disseminated lime; strongly alkaline; clear smooth boundary.

3Cgk—13 to 44 inches; gray (5Y 5/1) clay loam, gray (5Y 6/1) moist; massive; hard, very friable, sticky and plastic; violently effervescent; disseminated lime; strongly alkaline; clear smooth boundary.

4Cg—44 to 60 inches; light gray (5Y 7/1), stratified fine sandy loam and sandy clay loam, gray (5Y 5/1) moist; massive; soft, hard, very friable, nonsticky and sticky, nonplastic and plastic; common large distinct mottles; strongly effervescent; disseminated lime; strongly alkaline.

A water table is at a depth of 1 to 3 feet during most of the spring and summer. Conductivity ranges from 2 to 8 mmhos. It is highest at the surface. The A horizon has hue of 10YR or 2.5Y, value of 6 to 8 when dry and 4 or 5 when moist, and chroma of 1 to 3. It is strongly alkaline or very strongly alkaline. The Bg horizon is not continuous. It has hue of 10YR to 5Y and chroma of 1 or 2. It is sandy clay loam, fine sandy loam, or silty clay loam. It is strongly alkaline or very strongly alkaline. The C horizon has chroma of 1 or 2. In most pedons it is stratified fine sandy loam, sandy clay loam, clay loam, or silty clay loam. It is moderately alkaline or strongly alkaline.

Mishak Variant

The Mishak Variant consists of very deep, somewhat poorly drained and poorly drained, moderately permeable soils on bottom land and in depressions. These soils formed in mixed alluvium. Slopes are 0 to 3 percent.

Typical pedon of Mishak Variant sandy loam, in an area of Mishak-Mishak Variant complex, 0 to 3 percent slopes; 1,640 feet east of the northwest corner of sec. 13, T. 24 N., R. 106 W.

Az1—0 to 1 inch; light gray (2.5Y 7/2) sandy loam, olive brown (2.5Y 4/4) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; strongly effervescent; disseminated lime; very strongly alkaline; about 35 percent crystalline salts by volume; abrupt smooth boundary.

Az2—1 to 8 inches; light brownish gray (10YR 6/2) sandy clay loam, brown (10YR 4/3) moist; moderate fine granular structure; soft, very friable, sticky and plastic; few very fine roots; strongly effervescent; disseminated lime; strongly alkaline; 50 mmhos conductivity; some crystalline salts; clear smooth boundary.

C1—8 to 20 inches; light olive brown (2.5Y 5/4) sandy clay loam, olive brown (2.5Y 4/4) moist; massive; soft, very friable, sticky and plastic; few very fine roots; strongly effervescent; disseminated lime; strongly alkaline; clear wavy boundary.

C2—20 to 27 inches; light brownish gray (2.5Y 6/2) and yellowish brown (10YR 5/6) sandy clay loam, dark grayish brown (2.5Y 4/2) and dark yellowish brown (10YR 4/4) moist; massive; hard, friable, sticky and plastic; strongly effervescent; disseminated lime; strongly alkaline; abrupt wavy boundary.

2C3—27 to 37 inches; light olive brown (2.5Y 5/4) loamy sand, olive brown (2.5Y 4/4) moist; massive; loose, nonsticky and nonplastic; strongly effervescent; disseminated lime; strongly alkaline; few small masses of silt and clay; abrupt wavy boundary.

2C4—37 to 60 inches; grayish brown (2.5Y 5/2) gravelly loamy sand, dark grayish brown (2.5Y 4/2) moist; about 20 percent gravel; strongly effervescent; moderately alkaline.

Depth to the 2C horizon ranges from 24 to 40 inches. A water table is at a depth of 1 to 4 feet during part of spring and summer. The A horizon has hue of 10YR or 2.5Y, value of 6 to 8 when dry and 4 or 5 when moist, and chroma of 2 to 4. It is strongly alkaline or very strongly alkaline, and conductivity in this horizon is 4 to 100 mmhos. The C horizon has hue of 10YR to 5Y, value of 5 to 7 when dry and 4 or 5 when moist, and chroma of 1 to 6. It is sandy clay loam, clay loam, or silty clay loam. The 2C horizon is loamy sand to gravelly sand.

Pepton Series

The Pepton series consists of shallow, well drained, moderately rapidly permeable soils on upland plains. These soils formed in residuum. Slopes range from 0 to 6 percent.

Typical pedon of Pepton sandy loam, in an area of Sobson-Pepton-Edlin complex, 0 to 6 percent slopes; NW¼NW¼ sec. 21, T. 24 N., R. 107 W.

A1—0 to 2 inches; light brownish gray (10YR 6/2) sandy loam, dark brown (10YR 4/3) moist; moderate medium and thin platy structure; soft, very friable, slightly sticky and slightly plastic; few very fine and fine roots; mildly alkaline; abrupt wavy boundary.

A2—2 to 3 inches; light brownish gray (10YR 6/2) sandy loam, dark brown (10YR 4/3) moist; moderate fine granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots; mildly alkaline; abrupt wavy boundary.

Bw—3 to 11 inches; pale brown (10YR 6/3) sandy loam, dark yellowish brown (10YR 4/4) moist; weak coarse subangular blocky structure parting to moderate fine subangular blocky; slightly hard, very friable, slightly sticky and slightly plastic; common very fine and fine roots; mildly alkaline; clear wavy boundary.

Bk—11 to 15 inches; light olive brown (2.5Y 5/4) channery sandy loam, olive brown (2.5Y 4/4) moist; massive; soft, very friable, slightly sticky and slightly plastic; few fine roots; strongly effervescent; lime disseminated and as few thin crusts on the underside of some channers; about 35 percent channers; moderately alkaline; abrupt wavy boundary.

R—15 inches; hard, calcareous sandstone.

The A horizon has value of 5 or 6 when dry and 3 or 4 when moist and chroma of 2 or 3. The Bw horizon has value of 5 or 6 when dry and 3 or 4 when moist and chroma of 3 or 4. It is sandy loam or fine sandy loam. The Bk horizon has value of 6 to 8 when dry and 4 to 7 when moist and chroma of 2 to 4. It is fine sandy loam or channery sandy loam. The content of rock fragments in this horizon ranges from 0 to 35 percent. Hue is 10YR or 2.5Y throughout the profile.

Quealman Series

The Quealman series consists of very deep, moderately well drained, moderately rapidly permeable soils on bottom land along streams. These soils formed in mixed alluvium. Slopes are 0 to 3 percent.

Typical pedon of Quealman fine sandy loam, in an area of Quealman-Fluvaquents complex, 0 to 3 percent slopes; in the NW¼SE¼NW¼ sec. 26, T. 25 N., R. 106 W.

A1—0 to 1 inch; grayish brown (2.5 5/2) fine sandy loam, dark grayish brown (2.5Y 4/2) moist; weak very fine granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots; slightly effervescent; disseminated lime; moderately alkaline; abrupt wavy boundary.

A2—1 to 12 inches; grayish brown (2.5Y 5/2) fine sandy loam, dark grayish brown (2.5Y 4/2) moist; weak coarse prismatic structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine and few medium roots; slightly effervescent; disseminated lime; moderately alkaline; abrupt wavy boundary.

C1—12 to 34 inches; brown (10YR 5/3) and pale brown (10YR 6/3), stratified fine sandy loam and loamy fine sand, brown (10YR 5/3) moist; massive; soft, very friable, slightly sticky to nonsticky and plastic to nonplastic; few very fine to medium roots; strongly effervescent; disseminated lime; moderately alkaline and strongly alkaline; clear wavy boundary.

C2—34 to 60 inches; light gray (10YR 7/2) and light brownish gray (2.5Y 6/2), stratified loam and sand, brown (10YR 5/3) and olive brown (2.5Y 4/4) moist; massive; strongly effervescent; disseminated lime; moderately alkaline.

The entire profile has hue of 2.5Y or 10YR. It is mainly stratified fine sandy loam, loamy fine sand, or loam but has strata of clay loam, silty clay loam, or sand. The content of gravel is 0 to 5 percent throughout the profile.

Shellcreek Series

The Shellcreek series consists of very deep, moderately well drained, slowly permeable soils in depressions and on terraces, alluvial fans, and valley floors. These soils formed in alluvium. Slopes are 0 to 3 percent.

Typical pedon of Shellcreek silty clay, 0 to 1 percent slopes; 1,200 feet west and 2,390 feet north of the southeast corner of sec. 5, T. 25 N., R. 105 W.

A1—0 to 1 inch; light gray (5Y 7/2) silty clay, light olive brown (2.5Y 5/4) moist; moderate thin and medium platy structure; a soft, fragile crust in the upper ¼ inch; soft, friable, very sticky and very plastic; few very fine roots; strongly effervescent; disseminated lime; strongly alkaline; abrupt smooth boundary.

A2—1 to 3 inches; light olive gray (5Y 6/2) silty clay, olive brown (2.5Y 4/4) moist; moderate very fine granular structure; soft, friable, very sticky and very plastic; few very fine roots; strongly effervescent; disseminated lime; very strongly alkaline; clear wavy boundary.

Bw1—3 to 5 inches; pale olive (5Y 6/3) silty clay, olive brown (2.5Y 4/4) moist; weak coarse prismatic structure parting to moderate coarse angular blocky; extremely hard, very firm, very sticky and very plastic; few fine roots; strongly effervescent; lime disseminated and as few filaments in root channels; very strongly alkaline; clear smooth boundary.

Bw2—5 to 20 inches; pale olive (5Y 6/3) silty clay, olive brown (2.5Y 4/4) moist; weak coarse prismatic structure parting to moderate fine and medium subangular blocky; extremely hard, firm, very sticky and very plastic; few fine roots; strongly effervescent; lime disseminated and as few isolated specks along root channels; very strongly alkaline; clear smooth boundary.

Bk—20 to 24 inches; pale olive (5Y 6/3) silty clay, olive brown (2.5Y 4/4) moist; weak fine and medium subangular blocky structure; extremely hard, firm, very sticky and very plastic; strongly effervescent in matrix, violently effervescent where secondary carbonates occur as common soft masses and filaments; few fine nests of salts and sulfates; very strongly alkaline; diffuse wavy boundary.

C—24 to 60 inches; pale olive (5Y 6/3) silty clay, olive brown (2.5Y 4/4) moist; massive with fine and medium subangular fragments; extremely hard, firm, very sticky and very plastic; strongly effervescent; disseminated lime; very strongly alkaline.

The entire profile has hue of 10YR to 5Y. It is clay, silty clay, or silty clay loam. The A horizon has value of 5 to 7 when dry and 4 to 6 when moist and chroma of 2 to 4. The Bw horizon has value of 5 to 7 when dry and 4 or 5 when moist and chroma of 2 to 4. The Bk horizon has value of 5 to 7 when dry and 4 to 6 when moist and chroma of 2 to 4. The C horizon has value of 5 or 6 when dry and 4 or 5 when moist and chroma of 2 to 4.

Shellcreek Variant

The Shellcreek Variant consists of very deep, moderately well drained, slowly permeable soils on alluvial fans, stream terraces, and valley floors. These soils formed in mixed alluvium. Slopes are 0 to 2 percent.

Typical pedon of Shellcreek Variant silty clay, in an area of Debone Variant-Shellcreek Variant complex, 0 to 1 percent slopes; 2,000 feet north and 50 feet west of the southeast corner of sec. 1, T. 26 N., R. 106 W.

Az—0 to 2 inches; brown (10YR 5/3) silty clay, dark brown (10YR 4/3) moist; moderate very fine granular structure; loose and fluffy, very sticky and plastic; thin white salt coating on the surface; slightly effervescent; disseminated lime; strongly alkaline; 48 mmhos conductivity; abrupt wavy boundary.

Bw—2 to 5 inches; brown (10YR 5/3) silty clay, dark brown (10YR 4/3) moist; very weak medium columnar structure; hard, friable, very sticky and plastic; few very fine roots; slightly effervescent; disseminated lime; few small, white mycelia masses; moderately alkaline; 26 mmhos conductivity; clear wavy boundary.

C1—5 to 24 inches; yellowish brown (10YR 5/4) silty clay, dark brown (10YR 4/3) moist; massive; hard, friable, very sticky and plastic; few very fine roots; few small, light gray threads; slightly effervescent; disseminated lime; moderately alkaline; 15 mmhos conductivity; gradual wavy boundary.

C2—24 to 50 inches; light brownish gray (2.5Y 6/2) clay loam, olive brown (2.5Y 4/4) moist; massive; hard, friable, sticky and plastic; few very fine roots; slightly effervescent; disseminated lime; moderately alkaline; 5 mmhos conductivity; gradual wavy boundary.

C3—50 to 60 inches; light brownish gray (2.5Y 6/2) loam, olive brown (2.5Y 4/4) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; slightly effervescent; disseminated lime; moderately alkaline; 2 mmhos conductivity.

The Az horizon has hue of 10YR or 2.5Y, value of 4 to 7 when dry and 4 or 5 when moist, and chroma of 2 to 4. It is strongly alkaline or very strongly alkaline. Conductivity in this horizon ranges from 15 to 100 mmhos. The Bw horizon has hue of 10YR or 2.5Y, value of 4 to 6 when dry and 3 or 4 when moist, and chroma of 2 to 4. It is silty clay or silty clay loam. It is moderately alkaline to very strongly alkaline. Conductivity in this horizon is 8 to 30 mmhos. The C horizon has hue of 10YR to 5Y. It is dominantly silty clay to loam, but in some pedons it is coarser textured below a depth of 40 inches. It is moderately alkaline or strongly alkaline. Conductivity in this horizon ranges from 1 to 15 mmhos. A seasonal high water table is at a depth of 4 to 5 feet in the spring.

Sobson Series

The Sobson series consists of moderately deep, well drained, moderately rapidly permeable soils on upland plains. These soils formed in residuum. Slopes range from 0 to 6 percent.

Typical pedon of Sobson sandy loam, in an area of Sobson-Pepton-Edlin complex, 0 to 6 percent slopes; along power line in sec. 36, T. 24 N., R. 107 W.

A—0 to 2 inches; grayish brown (10YR 5/2) sandy loam, dark grayish brown (10YR 4/2) moist; weak thin platy structure; soft, very friable, nonsticky and nonplastic; mildly alkaline; abrupt smooth boundary.

Bw—2 to 12 inches; brown (10YR 5/3) sandy loam, dark brown (10YR 4/3) moist; weak coarse prismatic structure; soft, very friable, slightly sticky and slightly plastic; common very fine and fine and few medium roots; mildly alkaline; clear wavy boundary.

Bk1—12 to 19 inches; pale brown (10YR 6/3) sandy loam, dark brown (10YR 4/3) moist; weak medium subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; few very fine and fine roots; slightly effervescent; disseminated lime; moderately alkaline; clear wavy boundary.

Bk2—19 to 35 inches; pale brown (10YR 6/3) channery sandy loam, brown (10YR 5/3) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; few very fine and fine roots; about 20 percent channers; strongly alkaline; lime disseminated and as thin crusts on the underside of channers; moderately alkaline; abrupt wavy boundary.

Cr—35 inches; shale bedrock.

The depth to paralithic contact ranges from 20 to 40 inches. The A horizon has value of 5 or 6 when dry and 3 or 4 when moist and chroma of 2 or 3. The Bw horizon has value of 5 or 6 when dry and 4 or 5 when moist and chroma of 3 or 4. It is sandy loam or fine sandy loam. The Bk horizon has hue of 10YR or 2.5Y, value of 5 to 7 when dry and 4 or 5 when moist, and chroma of 2 or 3. It is sandy loam or channery sandy loam.

Space City Series

The Space City series consists of very deep, somewhat excessively drained, rapidly permeable soils on valley floors and terrace scarps. These soils formed in mixed alluvium. Slopes range from 0 to 30 percent.

Typical pedon of Space City loamy sand, 0 to 3 percent slopes; in the center of the SE¼ sec. 28, T. 25 N., R. 105 W.

A—0 to 3 inches; brown (10YR 5/3) loamy sand, dark grayish brown (10YR 4/2) moist; single grain; loose; mildly alkaline; common very fine and fine roots; clear smooth boundary.

Bw—3 to 16 inches; brown (10YR 5/3) loamy sand, dark yellowish brown (10YR 3/4) moist; very weak coarse prismatic structure; loose, very friable, nonsticky and nonplastic; mildly alkaline; common very fine and fine roots in the upper part, few in the lower part; clear wavy boundary.

C1—16 to 26 inches; grayish brown (10YR 5/2) loamy sand, dark brown (10YR 4/3) moist; massive; loose, very friable, nonsticky and nonplastic; mildly alkaline; gradual wavy boundary.

C2—26 to 60 inches; light gray (2.5Y 7/2) loamy sand, grayish brown (2.5Y 5/2) moist; single grain; loose; slightly effervescent; mildly alkaline.

The depth to effervescent material ranges from 24 to 30 inches. Textures throughout the profile are loamy coarse sand or loamy sand. The content of rock fragments is generally 1 or 2 percent but may be as much as 15 percent. The A horizon has chroma of 2 or 3 when dry or moist. The B horizon has value of 3 or 4 when moist and chroma of 2 to 4. The C horizon has hue of 10YR or 2.5Y, value of 5 to 7 when dry and 4 or 5 when moist, and chroma of 2 or 3. It is mildly alkaline or moderately alkaline.

Vonason Series

The Vonason series consists of very deep, well drained, moderately rapidly permeable soils on fan aprons, valley floors, fan piedmonts, and terraces. These soils formed in alluvium. Slopes range from 0 to 10 percent.

Typical pedon of Vonason loamy sand, 0 to 1 percent slopes; 1,300 feet east and 950 feet north of the southwest corner of sec. 5, T. 24 N., R. 106 W.

A—0 to 3 inches; grayish brown (10YR 5/2) loamy sand, dark brown (10YR 4/3) moist; weak thin platy structure parting to weak fine granular; soft, very friable, nonsticky and nonplastic; common very fine and fine roots; mildly alkaline; clear wavy boundary.
Bw—3 to 19 inches; brown (10YR 5/3) sandy loam, dark brown (10YR 4/3) moist; weak coarse prismatic structure parting to weak coarse subangular blocky; soft, very friable, slightly sticky and nonplastic; common very fine to medium roots; mildly alkaline; clear wavy boundary.
Bk—19 to 29 inches; light brownish gray (2.5Y 6/2) gravelly loamy sand, grayish brown (2.5Y 5/2) moist; massive; loose, very friable, nonsticky and nonplastic; few fine roots; violently effervescent; about 5 percent calcium carbonate disseminated and as white coatings on pebbles; about 30 percent pebbles; moderately alkaline; gradual wavy boundary.
C—29 to 60 inches; light brownish gray (2.5Y 6/2) gravelly loamy sand, grayish brown (2.5Y 5/2) moist; single grain; loose, nonsticky and nonplastic; few fine roots; strongly effervescent; about 4 percent disseminated calcium carbonate; about 27 percent pebbles; moderately alkaline.

The A horizon has value of 5 or 6 when dry and 3 or 4 when moist and chroma of 2 or 3. It is neutral or mildly alkaline. The Bw horizon has hue of 10YR or 2.5Y, value of 5 to 7 when dry and 3 or 4 when moist, and chroma of 3 or 4. It is neutral or mildly alkaline. The Bk and C horizons are loamy sand, gravelly loamy sand, or sand. They are mildly alkaline or moderately alkaline. The Bk horizon has hue of 10YR or 2.5Y, value of 6 or 7 when dry and 4 to 6 when moist, and chroma of 2 or 3. The C horizon has hue of 10YR or 2.5Y, value of 5 to 7 when dry and 4 to 6 when moist, and chroma of 2 to 4.

Worfman Series

The Worfman series consists of shallow, well drained, moderately permeable soils on upland plains. These soils formed in residuum. Slopes range from 0 to 6 percent.

Typical pedon of Worfman sandy loam, in an area of Worfman-Diamondville sandy loams, 0 to 6 percent slopes; in the SE¼NW¼ sec. 11, T. 26 N., R. 106 W.

A1—0 to 1 inch; grayish brown (10YR 5/2) sandy loam, dark brown (10YR 3/3) moist; weak fine granular structure; soft, very friable, slightly sticky and slightly plastic; common very fine and fine roots; neutral; abrupt wavy boundary.
A2—1 to 3 inches; grayish brown (10YR 5/2) sandy loam, dark brown (10YR 3/3) moist; weak medium subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; common very fine and fine roots; neutral; abrupt wavy boundary.
Bt—3 to 12 inches; yellowish brown (10YR 5/4) clay loam, dark yellowish brown (10YR 4/4) moist; moderate coarse and medium subangular blocky structure; very hard, friable, sticky and plastic; common very fine and few medium and fine roots; many moderately thick clay films on faces of peds; about 10 percent ¼- to 2-inch channers and pebbles; neutral; clear wavy boundary.
Bk—12 to 14 inches; brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; moderate very fine subangular blocky structure; slightly hard, friable, sticky and plastic; common very fine and fine roots; about 50 percent soft shale fragments that break down on pretreatment; strongly effervescent; lime occurs as ⅛-inch pockets and as thin crusts on the underside of shale fragments; moderately alkaline; clear wavy boundary.
Cr—14 inches; fractured shale.

The depth to bedrock ranges from 10 to 20 inches. The content of rock fragments generally ranges from 0 to 15 percent throughout the profile. In the Bk horizon, however, it may be as much as 60 percent. These fragments are both channers and pebbles, mostly ¼ inch to 2 inches in diameter. The A horizon has value of 3 or 4 when moist and chroma of 2 or 3. The Bt horizon has chroma of 3 or 4. It is loam or clay loam. The Bk horizon has hue of 2.5Y or 10YR, value of 5 or 6 when dry and 4 or 5 when moist, and chroma of 3 or 4. In areas that have shrubs, 1- to 2-inch coppice dunes of loamy sand cover about 30 percent of the surface. In some pedons the Bt horizon has a 1- to 3-inch layer of fragmented shale.

Youjay Series

The Youjay series consists of shallow, well drained, slowly permeable soils on upland plains. These soils formed in shale residuum. Slopes range from 1 to 5 percent.

Typical pedon of Youjay clay loam, in an area of Kandaly-Youjay complex, duned and gently sloping; 2,640 feet north of the southeast corner of sec. 15, T. 25 N., R. 105 W.

E—0 to 1 inch; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; weak medium platy structure parting to moderate fine granular; slightly hard, friable, sticky and plastic; about 30 percent of the surface is covered with 1/4- to 5-inch rounded pebbles and cobbles; slightly effervescent; disseminated lime; strongly alkaline; abrupt wavy boundary.

Btn—1 to 5 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; moderate medium columnar structure parting to moderate fine subangular blocky; very hard, firm, very sticky and plastic; few very fine and fine roots; slightly effervescent; disseminated lime; strongly alkaline; clear smooth boundary.

B&Cr—5 to 10 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; weak fine angular blocky structure; hard, firm, very sticky and plastic; common very fine to medium roots; about 50 percent soft shale fragments; strongly effervescent; lime disseminated and as small pockets and streaks; strongly alkaline; 4 mmhos conductivity; gradual wavy boundary.

Cr—10 inches; soft shale.

The depth to bedrock ranges from 10 to 20 inches. The entire profile has value of 5 or 6 when dry. The Btn horizon is clay or clay loam. Reaction is strongly alkaline or very strongly alkaline throughout the profile.

Formation of the Soils

This section relates the factors of soil formation to the soils in the survey area. Soil characteristics are determined by the interaction of five factors of soil formation. These are parent material, climate, plant and animal life, relief, and time. The influence of any one of these factors varies from place to place. The interaction of all the factors determines the kind of soil.

Parent Material

The soils in this survey area formed mainly in residuum, alluvium, and eolian material.

Residuum is material that weathered in place from bedrock. It is at the surface edges of the valley. The bedrock in Eden Valley is sedimentary. That along the western side and near the south end of the valley is the Laney sandstone and shale member of the Green River Formation. Pepton, Sobson, Huguston, and Elk Mountain soils formed in material weathered from these Laney rocks. Worfman and Diamondville soils, although slightly finer textured than those soils, also formed in this material. Along the eastern side of the valley are the more prominent scarps and small buttes. They are part of the Bridger shale formation. Haterton and Youjay soils formed in material weathered from this formation.

Alluvium is material transported and deposited by floodwater. Farson, Vonason, Bosler, Gunbarrel, Littlebear, Space City, Means, Hooper, Edlin, and Forelle soils formed in the older alluvial deposits, which are on the valley floor or fan piedmont and on the stream terraces and toe slopes of scarps. Clowers and Quealman soils and Fluvaquents formed in recent alluvium, which is along present streams. Debone, Debone Variant, Shellcreek, Shellcreek Variant, Mishak, and Mishak Variant soils also formed in alluvium. These alluvial soils are underlain by sedimentary rocks. These rocks, many of which are high in content of soluble salts, contribute to the salinity of the waste water that returns to the streams.

Eolian material consists mostly of sand particles that have been moved by wind and deposited as dunes. Cotopaxi and Kandaly soils formed on these dunes.

Climate

Climate affects soil formation through its influence on vegetation and the physical and chemical weathering of the parent material. The low precipitation in the survey area produces a relatively skimpy vegetative cover, which does not produce the high organic matter build-up in the topsoil characteristic of the prairies further east on the Great Plains. The low precipitation has also restricted the leaching of soluble salts.

Plant and Animal Life

The type and amount of shrubs, forbs, and grasses growing on the soil are governed mainly by the semiarid climate. The roots of these plants have loosened the soil and improved tilth and permeability. As the plants died, the decaying organic matter darkened and enriched the surface layer. These native plants provided food and cover for wildlife. Animal droppings and decaying bodies also enriched the soil.

Many of the small mammals indigenous to the area are burrowing rodents. They mixed the developed soil horizons and in many areas of rangeland have created mounds that are 3 to 6 inches high, and are 3 to 5 feet in diameter. These mounds make up 2 to 3 percent of the mapped areas. Because the rodents eat the grass roots, the vegetation in these areas is primarily shrubs.

Recently, humans have had a pronounced effect on the soil. The soil in cropped areas has been disturbed by tilling, establishing ditches to convey water, and constructing border dikes. Also, leveling in many areas has improved water distribution. It has removed the surface layer and in places the subsurface layer from small areas and deposited them in lower areas. The cut areas have a very low available water capacity and very low fertility, whereas the filled areas have a higher available water capacity and a deeper, more productive surface soil. Cutting and filling can result in a field of uneven yields. A sprinkler irrigation system can apply water evenly and eliminate the need for leveling. Irrigation has also increased the rate at which minerals are leached or washed from the soil.

Relief

Relief affects soil formation through its influence on runoff, erosion, and the degree of leaching within the soil profile. In the soils on nearly level, stable surfaces, such as Farson, Forelle, and Vonason soils, carbonates have been leached into the lower part of the subsoil. The soils on steep slopes, such as Haterton and Huguston soils, generally have carbonates at the surface. Also, they tend to be shallow because of erosion. Relief also affects drainage. It can result in the formation of wet soils, such as Gunbarrel, Littlebear, Mishak, and Mishak Variant soils, which receive runoff and have a seasonal high water table.

Time

Time, usually a long time, is needed for the processes of soil formation to form distinct horizons. The leaching of carbonates and the translocation of clay from the surface to the subsoil are the most widespread genetic processes in the survey area. Farson soils, which formed in the older alluvium on the valley floor, have been leached of carbonates in the surface layer and the upper part of the subsoil. These carbonates have accumulated in the lower part of the subsoil, forming a calcic horizon. Also, clay in these soils has been translocated from the surface layer to the upper part of the subsoil, forming an argillic horizon. In contrast to the Farson soils, Clowers and Quealman soils, which formed in the more recent alluvial deposits along present streams, have no genetic horizons, except for a slightly darkened surface layer. Bosler, Diamondville, Means, Elk Mountain, and Worfman soils have undergone a genetic process similar to that of the Farson soils.

A process somewhat similar to that which formed the Farson soils but that also includes the accumulation of sodium as well as clay in the subsoil results in soils that have a natric horizon. Examples are Debone, Debone Variant, Hooper, and Youjay soils. The content of clay in the natric horizon of these soils is 35 percent or more. This clay was translocated from the surface layer and dispersed in place by sodium.

The surface layer and subsurface layer of Edlin, Pepton, Sobson, and Vonason soils also have been leached of carbonates and some minerals. As a result of this leaching, a cambic horizon has formed. These soils formed in parent material that is slightly coarser textured than that of the soils having an argillic horizon.

The accumulation of salts at the surface through capillary rise of ground water has occurred in the wet Mishak and Mishak Variant soils. The salts are left on the surface as the water evaporates. These soils are classified as Halaquepts, signifying the salty surface and the wetness. Although not so wet, Shellcreek Variant soils have accumulated a large amount of salts on the surface. Farson Variant, Gunbarrel, Littlebear, and Means Variant soils have undergone the same process but to a lesser degree. Most of this "wicking" of salts to the surface is relatively recent and is brought about by a perched water table that is fed by irrigation.

A slight amount of leaching and structure development has occurred in Shellcreek soils, forming a cambic horizon. The surface layer and subsurface layer of Space City soils has been leached of carbonates, but the coarse texture hinders any development. The coarse texture and recent deposition of the soils on dunes, such as Cotopaxi and Kandaly soils, preclude any development.

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Glossary

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alkali (sodic) soil. A soil having so high a degree of alkalinity (pH 8.5 or higher), or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.

Alluvial fan. The fanlike deposit of a stream where it issues from a gorge upon a plain or of a tributary stream near or at its junction with its main stream.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

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—

Low	0 to 3.75
Moderate	3.75 to 7.5
High	more than 7.5

Base saturation. The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the total cation-exchange capacity.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Blowout. A shallow depression from which all or most of the soil material has been removed by wind. A blowout has a flat or irregular floor formed by a resistant layer or by an accumulation of pebbles or cobbles. In some blowouts the water table is exposed.

Bottom land. The normal flood plain of a stream, subject to flooding.

Brush management. Use of mechanical, chemical, or biological methods to control or eliminate competition of woody vegetation and thus allow understory grasses and forbs to recover, or to make conditions favorable for reseeding. It increases production of forage, which helps to control erosion. Brush management may improve the habitat for some species of wildlife.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

Channery soil. A soil that is, by volume, more than 15 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches along the longest axis. A single piece is called a channer.

Chemical treatment. Control of unwanted vegetation by use of chemicals.

Chiseling. Tillage with an implement having one or more soil-penetrating points that loosen the subsoil and bring clods to the surface. A form of emergency tillage to control soil blowing.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Climax plant community. The plant community on a given site that will be established if present environmental conditions continue to prevail and the site is properly managed.

Coarse fragments. Mineral or rock particles larger than 2 millimeters in diameter.

Coarse textured soil. Sand or loamy sand.

Cobble (or cobblestone). A rounded or partly rounded fragment of rock 3 to 10 inches (7.6 to 25 centimeters) in diameter.

Colluvium. Soil material, rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex, soil. A map unit of two or more kinds of soil or miscellaneous areas in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas.

Conservation cropping system. Growing crops in combination with needed cultural and management practices. If soil-improving crops and practices used in the system more than offset the soil-depleting crops and deteriorating practices, then it is a good conservation cropping system. Cropping systems are needed on all tilled soils. Examples of soil-improving practices in a conservation cropping system are the use of rotations that include grasses and legumes and the return of crop residue to the soil. Other examples are the use of green manure crops of grasses and legumes, proper tillage, applications of fertilizer, and weed and pest control.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Coppice dune. A small dune of fine grained soil material stabilized by shrubs or small trees.

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Crop residue management. Returning crop residue to the soil, which helps to maintain soil structure, organic matter content, and fertility and helps to control erosion.

Cropping system. Growing crops under a planned system of rotation and management practices.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Decreasers. The most heavily grazed climax range plants. Because they are the most palatable, they are the first to be destroyed by overgrazing.

Deferred grazing. Postponing grazing or resting grazing land for a prescribed period.

Depth, soil. The depth of a soil to bedrock. Soil depth classes are:

Very shallow	less than 10 inches
Shallow	10 to 20 inches
Moderately deep	20 to 40 inches

Deep	40 to 60 inches
Very deep	more than 60 inches

Depth to bedrock (in tables). Bedrock is too near the surface for 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.—These soils have very high and high hydraulic conductivity and a low available water capacity. They are not suited to crop production unless irrigated.

Somewhat excessively drained.—These soils have high hydraulic conductivity and a low available water capacity. Without irrigation, only a narrow range of crops can be grown and yields are low.

Well drained.—These soils have an intermediate available water capacity. They retain optimum amounts of moisture, but they are not wet close enough to the surface or long enough during the growing season for yields to be adversely affected.

Moderately well drained.—These soils are wet close enough to the surface or long enough that planting or harvesting activities or yields of some field crops are adversely affected unless a drainage system is installed. Moderately well drained soils commonly are characterized by a layer with low hydraulic conductivity, a wet layer relatively high in the profile, additions of water by seepage, or a combination of these.

Somewhat poorly drained.—These soils are wet close enough to the surface or long enough that planting or harvesting activities or crop growth is markedly restricted unless a drainage system is installed. Somewhat poorly drained soils commonly are characterized by a layer with low hydraulic conductivity, a wet layer high in the profile, additions of water through seepage, or a combination of these.

Poorly drained.—These soils commonly are so wet at or near the surface during a considerable part of the year that field crops cannot be grown under natural conditions. The poor drainage is caused by a saturated zone, a layer with low hydraulic conductivity, seepage, or a combination of these.

Very poorly drained.—These soils are wet to the surface most of the time. The wetness prevents the growth of important crops (except rice) unless a drainage system is installed.

Drainage, surface. Runoff, or surface flow of water, from an area.

Draw. A small stream valley, generally more open and with broader bottom land than a ravine or gulch.

Dune. A mound, ridge, or hill of windblown sand, either bare or covered with vegetation.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Ephemeral stream. A stream or portion of a stream that flows only in direct response to precipitation. It receives no long-continued supply from melting snow or any other source, and its channel is above the water table at all times.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, such as a fire, that exposes the surface.

Erosion pavement. A layer of gravel or stones that remains on the surface after fine particles are removed by sheet or rill erosion.

Escarpment. A relatively continuous and steep slope or cliff breaking the general continuity of more gently sloping land surfaces and produced by erosion or faulting. Synonym: scarp.

Excess fines (in tables). Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.

Fan terrace. A relict alluvial fan, no longer a site of active deposition, incised by younger and lower alluvial surfaces.

Fast intake (in tables). The rapid movement of water into the soil.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

Fine textured soil. Sandy clay, silty clay, or clay.

Flagstone. A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist 6 to 15 inches (15 to 38 centimeters) long.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Foot slope. The inclined surface at the base of a hill.

Forb. Any herbaceous plant not a grass or a sedge.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors and mottles.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock as much as 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Hard rock. Rock that cannot be excavated except by blasting or by the use of special equipment that is not commonly used in construction.

High-residue crops. Crops that produce large amounts of residue, such as small grain and corn used for grain. If properly managed, residue from these crops can be used to control erosion until the next crop in the rotation is established.

Hill. A natural elevation of the land surface, rising as much as 1,000 feet above surrounding lowlands, commonly of limited summit area and having a well defined outline; hillsides generally have slopes of more than 15 percent. The distinction between a hill and a mountain is arbitrary and is dependent on local usage.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. The major horizons are as follows:

O horizon.—An organic layer of fresh and decaying plant residue.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, alluminum, or some combination of these.

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 overlying soil material. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, the number 2 precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but it can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Increasers. Species in the climax vegetation that increase in amount as the more desirable plants are reduced by close grazing. Increasers commonly are the shorter plants and the less palatable to livestock.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake in inches per hour is expressed as follows:

Less than 0.2	very low
0.2 to 0.4	low
0.4 to 0.75	moderately low
0.75 to 1.25	moderate
1.25 to 1.75	moderately high
1.75 to 2.5	high
More than 2.5	very high

Intermittent stream. A stream or portion of a stream that flows for prolonged periods only when it receives ground water discharge or a long-continued supply from melting snow or other surface or shallow subsurface sources.

Invaders. On range, plants that encroach into an area and grow after the climax vegetation has been reduced by grazing. Generally, plants invade following disturbance of the surface.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are—

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the 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.

Knoll. A small, low, rounded hill rising above adjacent landforms.

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.

Light textured soil. Sand or loamy sand.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Low-residue crops. Crops that produce little residue, such as corn used for silage, peas, beans, and potatoes. The residue from these crops is not adequate to control erosion until the next crop in the rotation is established.

Low strength. The soil is not strong enough to support loads.

Mechanical treatment. Use of mechanical equipment for seeding, brush management, and other management practices.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Coarse sandy loam, sandy loam, or fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, or silty clay loam.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Mountain. A natural elevation of the land surface, rising more than 1,000 feet above surrounding lowlands, commonly of restricted summit area (relative to a plateau) and generally having steep sides and considerable bare-rock surface. A mountain can occur as a single, isolated mass or in a group forming a chain or range.

Munsell notation. A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color in hue of 10YR, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil, adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management. For example, slope, stoniness, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range in moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Playa. The generally dry and nearly level lake plain that occupies the lowest parts of closed depressional areas, such as those on intermontane basin floors. Temporary flooding occurs primarily in response to precipitation and runoff.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poor filter (in tables). Because of rapid permeability or an impermeable layer near the surface, the soil may not adequately filter effluent from a waste disposal system.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Potential native plant community. See Climax plant community.

Prescribed burning. The deliberate use of fire under suitable conditions of weather, soil moisture, and time of day. The area to be burned is predetermined, and the intensity of the fire is controlled.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Proper grazing use. Grazing at an intensity that maintains enough cover to protect the soil and maintain or improve the quantity and quality of the desirable vegetation. This measure improves the vigor and reproduction of the key plants and promotes the accumulation of litter and mulch necessary to conserve soil and water.

Range condition. The present composition of the plant community on a range site in relation to the potential natural plant community for that site. Range condition is expressed as excellent, good, fair, or poor on the basis of how much the present plant community has departed from the potential.

Rangeland. Land on which the potential natural vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. It includes natural grasslands, savannas, many wetlands, some deserts, tundras, and areas that support certain forb and shrub communties.

Range site. An area of rangeland where climate, soil, and relief are sufficiently uniform to produce a distinct natural plant community. A range site is the product of all the environmental factors responsible for its development. It is typified by an association of species that differ from those on other range sites in kind or proportion of species or total production.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are—

Extremely acid	below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rill. A steep-sided channel resulting from accelerated erosion. A rill is generally a few inches deep and not wide enough to be an obstacle to farm machinery.

Road cut. A sloping surface produced by mechanical means during road construction. It is commonly on the uphill side of the road.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Saline soil. A soil containing soluble salts in an amount that impairs growth of plants. A saline soil does not contain excess exchangeable sodium.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-size particles.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the substratum. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and runoff water.

Shrink-swell (in tables). The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silica. A combination of silicon and oxygen. The mineral form is called quartz.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

Slick spot. A small area of soil having a puddled, crusted, or smooth surface and an excess of exchangeable sodium. The soil is generally silty or clayey, is slippery when wet, and is low in productivity.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance. In this survey the following slope classes are recognized:

Level	0 to 1 percent
Nearly level	1 to 3 percent
Gently sloping	3 to 6 percent
Moderately sloping	6 to 10 percent
Moderately steep	10 to 30 percent
Steep	30 to 60 percent

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

Slow intake (in tables). The slow movement of water into the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.5 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Sodic soil. See Alkali (sodic) soil.

Sodicity. The degree to which a soil is affected by exchangeable sodium. Sodicity is expressed as a sodium absorption ratio (SAR) of a saturation extract, or the ratio of Na^+ to Ca^+ + Mg^{++}. The degrees of sodicity and their respective ratios are—

Slight	less than 13:1
Moderate	13-30:1
Strong	more than 30:1

Soft rock. Rock that can be excavated with trenching machines, backhoes, small rippers, and other equipment commonly used in construction.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the substratum. The living roots and plant and animal activities are largely confined to the solum.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded or 6 to 15 inches (15 to 38 centimeters) in length if flat.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grain* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Tilling a soil below normal plow depth, ordinarily to shatter a hardpan or claypan.

Substratum. The part of the soil below the solum.

Subsurface layer. Technically, the E horizon. Generally refers to a leached horizon lighter in color and lower in content of organic matter than the overlying surface layer.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Tailwater. The water directly downstream from a structure.

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or 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 loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material too thin for the specified use.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toe slope. The outermost inclined surface at the base of a hill; part of a foot slope.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Trace elements. Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, are in soils in extremely small amounts. They are essential to plant growth.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Valley fill. In glaciated regions, material deposited in stream valleys by glacial meltwater. In nonglaciated regions, alluvium deposited by heavily loaded streams.

Variant, soil. A soil having properties sufficiently different from those of other known soils to justify a new series name, but occurring in such a limited geographic area that creation of a new series is not justified.

Variegation. Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically a sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

(Recorded in the period 1915-84 at Farson, Wyoming)

Month	Temperature						Precipitation			
	Average daily maximum	Average daily minimum	Average	2 years in 10 will have-- Maximum temperature higher than--	2 years in 10 will have-- Minimum temperature lower than--	Average number of growing degree days*	Average	2 years in 10 will have-- Less than--	2 years in 10 will have-- More than--	Average number of days with 0.10 inch or more
	°F	°F	°F	°F	°F	Units	In	In	In	
January-----	25.9	-6.4	9.8	46	-38	0	0.41	0.13	0.65	1
February----	31.3	-.9	15.2	49	-34	0	.41	.14	.63	1
March-------	40.0	11.0	25.5	62	-20	4	.47	.18	.83	1
April-------	53.3	22.3	37.8	74	0	65	.71	.29	1.08	2
May---------	65.2	30.7	47.9	83	14	266	1.02	.37	1.64	3
June--------	74.9	38.3	56.6	90	24	501	.92	.26	1.62	2
July--------	83.5	44.2	63.8	93	30	786	.68	.18	1.16	1
August------	80.8	41.7	61.2	91	27	675	.68	.21	1.14	1
September---	71.6	32.6	52.1	87	14	376	.72	.26	1.28	2
October-----	59.9	22.1	41.0	77	3	107	.70	.23	1.22	2
November----	42.0	9.1	25.6	63	-20	3	.38	.17	.66	1
December----	29.8	-1.7	14.1	50	-33	0	.37	.18	.57	1
Yearly:										
Average---	54.8	20.3	37.5	---	---	---	---	---	---	---
Extreme---	---	---	---	96	-41	---	---	---	---	---
Total-----	---	---	---	---	---	2,784	7.45	3.50	9.18	18

* A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (50 degrees F).

TABLE 2.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Sweetwater	Sublette	Total-- Area	Total-- Extent
		Acres	Acres	Acres	Pct
50	Bosler sandy loam, 0 to 1 percent slopes	350	0	350	0.5
51	Bosler-Hooper complex, 0 to 2 percent slopes	981	0	981	1.3
52	Clowers-Debone-Edlin complex, 0 to 3 percent slopes	524	0	524	0.7
53	Debone-Shellcreek Variant complex, 0 to 2 percent slopes	1,470	0	1,470	1.9
54	Debone Variant-Shellcreek Variant complex, 0 to 1 percent slopes	1,050	27	1,077	1.4
55	Diamondville-Forelle sandy loams, 0 to 3 percent slopes	1,060	0	1,060	1.4
56	Edlin fine sandy loam, 0 to 1 percent slopes	369	0	369	0.5
57	Edlin fine sandy loam, 1 to 6 percent slopes	1,136	190	1,326	1.7
58	Edlin-Cotopaxi complex, gently sloping and duned	850	0	850	1.1
59	Edlin-Huguston complex, 6 to 30 percent slopes	1,093	400	1,493	1.9
60	Elk Mountain sandy loam, 0 to 1 percent slopes	800	0	800	1.0
61	Elk Mountain sandy loam, 1 to 6 percent slopes	2,350	0	2,350	3.1
62	Farson sandy loam, 0 to 1 percent slopes	10,895	0	10,895	14.1
63	Farson sandy loam, 1 to 3 percent slopes	3,010	230	3,240	4.2
64	Farson sandy loam, wet, 0 to 1 percent slopes	3,720	0	3,720	4.8
65	Farson-Means sandy loams, 3 to 10 percent slopes	568	0	568	0.7
66	Farson Variant gravelly sandy loam, 0 to 1 percent slopes	742	0	742	1.0
67	Fluvaquents, 0 to 3 percent slopes	515	0	515	0.7
68	Forelle sandy loam, 0 to 1 percent slopes	210	0	210	0.3
69	Forelle-Diamondville sandy loams, 3 to 6 percent slopes	395	0	395	0.5
70	Gunbarrel loamy sand, 0 to 1 percent slopes	960	0	960	1.2
71	Haterton loam, 1 to 10 percent slopes	253	0	253	0.3
72	Haterton, thin solum-Haterton complex, 10 to 30 percent slopes	428	0	428	0.6
73	Hooper-Hooper, overblown, complex, 0 to 1 percent slopes	850	0	850	1.1
74	Kandaly fine sand, 3 to 20 percent slopes	300	0	300	0.4
75	Kandaly-Youjay complex, duned and gently sloping	1,090	0	1,090	1.4
76	Littlebear loamy sand, 0 to 2 percent slopes	605	0	605	0.8
77	Means-Farson sandy loams, 0 to 1 percent slopes	3,210	0	3,210	4.2
78	Means-Farson sandy loams, 1 to 3 percent slopes	2,600	20	2,620	3.4
79	Means Variant sandy loam, 0 to 1 percent slopes	990	0	990	1.3
80	Mishak-Mishak Variant complex, 0 to 3 percent slopes	2,555	0	2,555	3.3
81	Quealman-Fluvaquents complex, 0 to 3 percent slopes	2,180	0	2,180	2.8
82	Shellcreek silty clay, 0 to 1 percent slopes	520	0	520	0.7
83	Shellcreek silty clay, nonsodic, 0 to 1 percent slopes	313	0	313	0.4
84	Shellcreek silty clay, nonsodic, 1 to 3 percent slopes	164	0	164	0.2
85	Sobson-Pepton-Edlin complex, 0 to 6 percent slopes	2,780	0	2,780	3.6
86	Space City loamy sand, 0 to 3 percent slopes	1,050	0	1,050	1.4
87	Space City loamy sand, 8 to 30 percent slopes	820	0	820	1.1
88	Vonason loamy sand, 0 to 1 percent slopes	6,320	0	6,320	8.2
89	Vonason loamy sand, 1 to 3 percent slopes	5,410	0	5,410	7.0
90	Vonason loamy sand, 3 to 6 percent slopes	800	0	800	1.0
91	Vonason-Cotopaxi complex, nearly level and duned	980	0	980	1.3
92	Worfman-Diamondville sandy loams, 0 to 6 percent slopes	3,350	1,100	4,450	5.8
93	Pits, borrow and gravel	429	13	442	0.6
	Water	1,995	1,900	3,895	5.1
	Total	73,040	3,880	76,920	100.0

TABLE 3.--LAND CAPABILITY CLASSES AND YIELDS PER ACRE OF IRRIGATED CROPS

(Only those soils suitable for irrigation are shown. Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil)

Soil name and map symbol	Land capability*	Alfalfa hay	Grass hay	Barley	Oats
		Tons	Tons	Bu	Bu
50 Bosler	IVs	4.0	4.0	70	90
51:					
Bosler	IVe	---	3.0	50	---
Hooper	IVs	---	3.0	50	---
55 Diamondville-Forelle	IVe	4.0	4.0	70	90
56 Edlin	IVs	4.0	4.0	70	80
57 Edlin	IVe	3.5	3.5	50	60
60 Elk Mountain	IVs	3.5	3.5	60	80
61 Elk Mountain	IVe	3.0	3.0	50	70
62, 63 Farson	IVs	4.0	4.0	70	90
64 Farson	IVw	---	3.0	60	70
65 Farson-Means	IVe	3.5	3.0	50	60
66 Farson Variant	VIs	---	2.0	40	---
68 Forelle	IVc	4.0	4.0	70	90
69 Forelle-Diamondville	IVe	3.0	3.0	50	70
73 Hooper-Hooper, overblown	VIs	---	---	---	---
76 Littlebear	IVs	---	2.0	40	---
77, 78 Means-Farson	IVs	4.0	4.0	70	90
79 Means Variant	IVs	---	2.5	50	---
81*:					
Quealman	IVe	---	3.0	60	70
Fluvaquents	Vw	---	---	---	---

See footnotes at end of table.

TABLE 3.--LAND CAPABILITY CLASSES AND YIELDS PER ACRE OF IRRIGATED CROPS--Continued

Soil name and map symbol	Land capability*	Alfalfa hay	Grass hay	Barley	Oats
		Tons	Tons	Bu	Bu
83, 84-------------------- Shellcreek	IVs	3.0	3.0	50	60
86------------------------ Space City	IVs	3.0	3.0	50	60
88, 89-------------------- Vonason	IVs	4.0	4.0	70	90
90------------------------ Vonason	IVs	3.0	3.0	50	70

* If irrigated.
** See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 4.--EXPECTED HEIGHTS OF SELECTED WOODY SPECIES AT AGE 20 BY SUITABILITY GROUP

(Dashes indicate that the species is not suited to the soils in the group)

Woody species	Group 1K		Group 6G		Group 6R		Group 7	
	5-9" precipi-tation	Irri-gated	5-9" precipi-tation	Irri-gated	5-9" precipi-tation	Irri-gated	5-9" precipi-tation	Irri-gated
	Ft	Ft	Ft	Ft	Ft	Ft	Ft	Ft
Conifers:								
Austrian pine	---	---	---	21	---	21	---	20
Blue spruce	---	21	---	18	---	18	---	18
Eastern redcedar	---	14	---	18	---	18	---	18
Ponderosa pine	---	22	---	20	---	20	---	20
Rocky Mountain juniper	---	20	---	16	---	16	---	16
Deciduous trees:								
Boxelder	---	---	---	18	---	18	---	18
Golden willow	---	31	---	---	---	26	---	---
Green ash	---	24	---	26	---	26	---	26
Honeylocust	---	26	---	23	---	25	---	23
Plains cottonwood	---	37	---	30	---	30	---	25
Russian olive	*10	23	---	21	---	23	---	21
Siberian crabapple	---	---	---	18	---	18	---	18
Siberian elm	---	31	---	28	---	30	---	28
Shrubs:								
American plum	---	9	---	9	---	9	---	9
Basin big sagebrush	---	---	2	---	2	---	---	---
Common chokecherry	---	10	---	10	---	10	---	10
Fourwing saltbush	2	3	2	---	2	---	---	---
Golden currant	---	---	---	5	---	5	---	5
Greasewood	2	---	---	---	---	---	---	---
Lilac	---	10	---	8	---	8	---	8
Nanking cherry	---	---	---	6	---	7	---	6
Peking cotoneaster	---	---	---	6	---	6	---	6
Redosier dogwood	---	---	---	6	---	6	---	6
Rubber rabbitbrush	2	---	2	---	1	---	1	---
Rugosa rose	---	---	---	5	---	5	---	5
Saskatoon serviceberry	---	---	---	5	---	5	---	5
Siberian peashrub	---	11	---	10	---	10	---	10
Silver buffaloberry	---	11	---	10	---	10	---	9
Skunkbush sumac	---	9	---	6	---	7	---	---
Tatarian honeysuckle	---	10	---	10	---	10	---	10
Western sandcherry	---	---	---	3	---	3	---	3
Woods rose	---	---	---	---	---	---	---	6

See footnote at end of table.

TABLE 4.--EXPECTED HEIGHTS OF SELECTED WOODY SPECIES AT AGE 20 BY SUITABILITY GROUP--Continued

Woody species	Group 8		Group 9G		Group 9N		Group 10	
	5-9" precipi- tation	Irri- gated	5-9" precipi- tation	Irri- gated	5-9" precipi- tation	Irri- gated	5-9" precipi- tation	Irri- gated
	Ft	Ft	Ft	Ft	Ft	Ft	Ft	Ft
Conifers:								
Austrian pine	---	---	---	---	---	---	---	---
Blue spruce	---	18	---	---	---	---	---	---
Eastern redcedar	---	18	---	18	---	18	---	---
Ponderosa pine	---	21	---	---	---	19	---	---
Rocky Mountain juniper	---	15	---	15	---	14	---	---
Deciduous trees:								
Boxelder	---	---	---	---	---	---	---	---
Golden willow	---	---	---	---	---	---	---	---
Green ash	---	28	---	24	---	20	---	---
Honeylocust	---	28	---	24	---	---	---	---
Plains cottonwood	---	38	---	37	---	30	---	---
Russian olive	---	22	---	21	---	---	---	---
Siberian crabapple	---	---	---	---	---	---	---	---
Siberian elm	---	30	---	29	---	26	---	---
Shrubs:								
American plum	---	9	---	---	---	---	---	---
Basin big sagebrush	2	---	---	---	2	---	---	---
Common chokecherry	---	11	---	---	---	---	---	---
Fourwing saltbush	2	---	2	---	2	---	---	---
Golden currant	---	---	---	---	---	---	---	---
Greasewood	---	---	2	---	---	---	---	---
Lilac	---	9	---	9	---	9	---	---
Nanking cherry	---	---	---	---	---	---	---	---
Peking cotoneaster	---	---	---	---	---	---	---	---
Redosier dogwood	---	---	---	---	---	---	---	---
Rubber rabbitbrush	2	---	2	---	2	---	---	---
Rugosa rose	---	---	---	---	---	---	---	---
Saskatoon serviceberry	---	---	---	---	---	---	---	---
Siberian peashrub	---	10	---	10	---	8	---	---
Silver buffaloberry	---	11	---	10	---	---	---	---
Skunkbush sumac	---	7	---	8	---	8	---	---
Tatarian honeysuckle	---	11	---	10	---	10	---	---
Western sandcherry	---	---	---	---	---	---	---	---
Woods rose	---	---	---	---	---	---	---	---

* Supplemental water is needed during the 3- to 5-year establishment period.

TABLE 5.--BUILDING SITE DEVELOPMENT

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
50: Bosler	Severe: cutbanks cave.	Moderate: shrink-swell.	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.
51*:					
Bosler	Severe: cutbanks cave.	Moderate: shrink-swell.	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.
Hooper	Severe: cutbanks cave.	Slight	Moderate: wetness.	Slight	Slight.
52*:					
Clowers	Slight	Severe: flooding.	Severe: flooding.	Severe:. flooding.	Moderate: flooding.
Debone	Moderate: too clayey.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.
Edlin	Slight	Slight	Slight	Slight	Slight.
53*:					
Debone	Moderate: too clayey.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.
Shellcreek Variant	Moderate: too clayey, wetness.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: shrink-swell, low strength.
54*:					
Debone Variant	Moderate: too clayey.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: shrink-swell, low strength.
Shellcreek Variant	Moderate: too clayey, wetness.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: shrink-swell, low strength.
55*:					
Diamondville	Moderate: depth to rock.	Moderate: shrink-swell.	Moderate: depth to rock, shrink-swell.	Moderate: shrink-swell.	Severe: low strength.
Forelle	Slight	Slight	Slight	Slight	Slight.
56, 57: Edlin	Slight	Slight	Slight	Slight	Slight.
58*:					
Edlin	Slight	Slight	Slight	Slight	Slight.
Cotopaxi	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.

See footnote at end of table.

TABLE 5.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
59*:					
Edlin	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Huguston	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.
60, 61 Elk Mountain	Moderate: depth to rock.	Slight	Moderate: depth to rock.	Slight	Slight.
62, 63 Farson	Severe: cutbanks cave.	Slight	Slight	Slight	Slight.
64 Farson	Severe: cutbanks cave.	Slight	Moderate: wetness.	Slight	Slight.
65*:					
Farson	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.
Means	Severe: cutbanks cave.	Moderate: slope.	Moderate: depth to rock, slope.	Severe: slope.	Moderate: slope.
66 Farson Variant	Severe: cutbanks cave.	Slight	Moderate: wetness.	Slight	Moderate: frost action.
67. Fluvaquents					
68 Forelle	Slight	Slight	Slight	Slight	Slight.
69*:					
Forelle	Slight	Slight	Slight	Moderate: slope.	Slight.
Diamondville	Moderate: depth to rock.	Moderate: shrink-swell.	Moderate: depth to rock, shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.
70 Gunbarrel	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, frost action.
71 Haterton	Severe: depth to rock.	Moderate: depth to rock.	Severe: depth to rock.	Moderate: slope, depth to rock.	Moderate: depth to rock.
72*:					
Haterton, thin solum	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.
Haterton	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.

See footnote at end of table.

TABLE 5.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
73*:					
Hooper	Severe: cutbanks cave.	Slight	Moderate: wetness.	Slight	Slight.
Hooper, overblown	Severe: cutbanks cave.	Slight	Moderate: wetness.	Slight	Slight.
74 Kandaly	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.
75*:					
Kandaly	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.
Youjay	Severe: depth to rock.	Moderate: shrink-swell, depth to rock.	Severe: depth to rock.	Moderate: shrink-swell, depth to rock.	Moderate: depth to rock, shrink-swell.
76 Littlebear	Severe: cutbanks cave.	Slight	Slight	Slight	Slight.
77*, 78*:					
Means	Severe: cutbanks cave.	Slight	Moderate: depth to rock.	Slight	Slight.
Farson	Severe: cutbanks cave.	Slight	Slight	Slight	Slight.
79 Means Variant	Severe: cutbanks cave.	Slight	Moderate: wetness, depth to rock.	Slight	Moderate: frost action.
80*:					
Mishak	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.
Mishak Variant	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, frost action.
81*:					
Quealman	Severe: cutbanks cave, wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Moderate: wetness, flooding, frost action.
Fluvaquents.					
82, 83, 84 Shellcreek	Moderate: too clayey.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: shrink-swell, low strength.
85*:					
Sobson	Severe: depth to rock.	Moderate: depth to rock.	Severe: depth to rock.	Moderate: depth to rock.	Moderate: depth to rock.
Pepton	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.
Edlin	Slight	Slight	Slight	Slight	Slight.

See footnote at end of table.

TABLE 5.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
86---------------- Space City	Severe: cutbanks cave.	Slight-----------	Slight-----------	Slight------------	Slight.
87---------------- Space City	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
88, 89------------ Vonason	Severe: cutbanks cave.	Slight-----------	Slight-----------	Slight------------	Slight.
90---------------- Vonason	Severe: cutbanks cave.	Slight-----------	Slight-----------	Moderate: slope.	Slight.
91*:					
Vonason----------	Severe: cutbanks cave.	Slight-----------	Slight-----------	Slight------------	Slight.
Cotopaxi---------	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.
92*:					
Worfman----------	Severe: depth to rock.	Moderate: shrink-swell, depth to rock.	Severe: depth to rock.	Moderate: shrink-swell, depth to rock.	Moderate: depth to rock, shrink-swell.
Diamondville-----	Moderate: depth to rock.	Moderate: shrink-swell.	Moderate: depth to rock, shrink-swell.	Moderate: shrink-swell.	Severe: low strength.
93*. Pits					

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 6.--SANITARY FACILITIES

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfills
50 Bosler	Severe: poor filter.	Severe: seepage.	Severe: too sandy.
51*:			
Bosler	Severe: poor filter.	Severe: seepage.	Severe: too sandy.
Hooper	Severe: poor filter.	Severe: seepage.	Severe: wetness, too sandy, excess salt.
52*:			
Clowers	Moderate: flooding, percs slowly.	Moderate: seepage.	Moderate: flooding.
Debone	Moderate: flooding.	Severe: seepage.	Moderate: flooding.
Edlin	Slight	Severe: seepage.	Slight.
53*:			
Debone	Moderate: flooding.	Severe: seepage.	Moderate: flooding.
Shellcreek Variant	Severe: percs slowly.	Slight	Severe: wetness, excess salt.
54*:			
Debone Variant	Severe: percs slowly.	Slight	Moderate: flooding.
Shellcreek Variant	Severe: percs slowly.	Slight	Severe: wetness, excess salt.
55*:			
Diamondville	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.
Forelle	Moderate: percs slowly.	Moderate: seepage.	Slight.
56, 57 Edlin	Slight	Severe: seepage.	Slight.
58*:			
Edlin	Slight	Severe: seepage.	Slight.

See footnote at end of table.

TABLE 6.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfills
58*:			
Cotopaxi	Severe: poor filter.	Severe: seepage, slope.	Severe: too sandy.
59*:			
Edlin	Severe: slope.	Severe: seepage, slope.	Severe: slope.
Huguston	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, slope.
60, 61 Elk Mountain	Severe: depth to rock.	Severe: seepage, depth to rock.	Severe: depth to rock.
62, 63 Farson	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.
64 Farson	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, too sandy.
65*:			
Farson	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.
Means	Severe: depth to rock, poor filter.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, too sandy.
66 Farson Variant	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, too sandy.
67. Fluvaquents			
68 Forelle	Moderate: percs slowly.	Moderate: seepage.	Slight.
69*:			
Forelle	Moderate: percs slowly.	Moderate: seepage, slope.	Slight.
Diamondville	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.
70 Gunbarrel	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.

See footnote at end of table.

TABLE 6.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfills
71: Haterton	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.
72*:			
Haterton, thin solum	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.
Haterton	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.
73*:			
Hooper	Severe: poor filter.	Severe: seepage.	Severe: wetness, too sandy, excess salt.
Hooper, overblown	Severe: poor filter.	Severe: seepage.	Severe: wetness, too sandy, excess salt.
74: Kandaly	Severe: poor filter.	Severe: seepage, slope.	Severe: too sandy.
75*:			
Kandaly	Severe: poor filter.	Severe: seepage, slope.	Severe: too sandy.
Youjay	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.
76: Littlebear	Severe: poor filter.	Severe: seepage.	Moderate: too sandy.
77*:			
Means	Severe: depth to rock, poor filter.	Severe: seepage, depth to rock.	Severe: depth to rock, seepage, too sandy.
Farson	Severe: poor filter.	Severe: seepage.	Severe: depth to rock, seepage, too sandy.
78*:			
Means	Severe: depth to rock, poor filter.	Severe: seepage, depth to rock.	Severe: depth to rock, seepage, too sandy.
Farson	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.

See footnote at end of table.

TABLE 6.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfills
79------------------ Means Variant	Severe: depth to rock, wetness, poor filter.	Severe: seepage, depth to rock, wetness.	Severe: depth to rock, seepage, too sandy.
80*:			
Mishak-------------	Severe: wetness.	Severe: wetness.	Severe: wetness, excess sodium, excess salt.
Mishak Variant-----	Severe: flooding, wetness, poor filter.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.
81*:			
Quealman-----------	Severe: wetness.	Severe: seepage, wetness.	Severe: wetness.
Fluvaquents.			
82, 83-------------- Shellcreek	Severe: percs slowly.	Slight----------------------	Severe: too clayey.
84------------------ Shellcreek	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.
85*:			
Sobson-------------	Severe: depth to rock.	Severe: seepage, depth to rock.	Severe: depth to rock.
Pepton-------------	Severe: depth to rock.	Severe: seepage, depth to rock.	Severe: depth to rock, seepage.
Edlin--------------	Slight----------------------	Severe: seepage.	Slight.
86------------------ Space City	Severe: poor filter.	Severe: seepage.	Severe: too sandy.
87------------------ Space City	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: slope, too sandy.
88, 89, 90---------- Vonason	Severe: poor filter.	Severe: seepage.	Severe: cemented pan, seepage, too sandy.
91*:			
Vonason------------	Severe: poor filter.	Severe: seepage.	Severe: cemented pan, seepage, too sandy.

See footnote at end of table.

TABLE 6.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfills
91*:			
Cotopaxi-----------	Severe: poor filter.	Severe: seepage, slope.	Severe: too sandy.
92*:			
Worfman------------	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.
Diamondville-------	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.
93*. Pits			

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 7.--CONSTRUCTION MATERIALS

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
50 Bosler	Good	Probable	Improbable: thin layer.	Poor: small stones, area reclaim.
51*:				
Bosler	Good	Probable	Improbable: thin layer.	Poor: small stones, area reclaim.
Hooper	Good	Probable	Probable	Poor: small stones, area reclaim, excess salt.
52*:				
Clowers	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Debone	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, excess sodium.
Edlin	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
53*:				
Debone	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, excess sodium.
Shellcreek Variant	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess salt.
54*:				
Debone Variant	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess sodium.
Shellcreek Variant	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess salt.
55*:				
Diamondville	Poor: depth to rock, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: depth to rock, too clayey, small stones.
Forelle	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
56, 57 Edlin	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.

See footnote at end of table.

TABLE 7.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
58*:				
Edlin	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Cotopaxi	Good	Probable	Improbable: too sandy.	Poor: too sandy, slope.
59*:				
Edlin	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Huguston	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, slope.
60, 61 Elk Mountain	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
62, 63 Farson	Good	Probable	Probable	Poor: too sandy, small stones.
64 Farson	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy, small stones.
65*:				
Farson	Good	Probable	Probable	Poor: too sandy, small stones.
Means	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
66 Farson Variant	Good	Probable	Probable	Poor: too sandy, small stones.
67. Fluvaquents				
68 Forelle	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
69*:				
Forelle	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
Diamondville	Poor: depth to rock, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: depth to rock, too clayey, small stones.
70 Gunbarrel	Fair: wetness.	Probable	Improbable: too sandy.	Poor: small stones, excess salt.

See footnote at end of table.

TABLE 7.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
71 Haterton	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones.
72*:				
Haterton, thin solum	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones, slope.
Haterton	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones, slope.
73*:				
Hooper	Good	Probable	Probable	Poor: area reclaim, excess salt.
Hooper, overblown	Good	Probable	Probable	Poor: small stones, area reclaim, excess salt.
74 Kandaly	Good	Probable	Improbable: too sandy.	Poor: too sandy.
75*:				
Kandaly	Good	Probable	Improbable: too sandy.	Poor: too sandy.
Youjay	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, too clayey, excess sodium.
76 Littlebear	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones.
77*:				
Means	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Farson	Fair: depth to rock, thin layer.	Improbable: thin layer.	Improbable: too sandy.	Poor: too sandy, small stones.
78*:				
Means	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Farson	Good	Probable	Probable	Poor: too sandy, small stones.
79 Means Variant	Poor: depth to rock.	Improbable: thin layer.	Improbable: too sandy.	Poor: too sandy, small stones.

See footnote at end of table.

TABLE 7.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
80*:				
Mishak	Fair: shrink-swell, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess salt, excess sodium.
Mishak Variant	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, excess sodium.
81*:				
Quealman	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy, small stones, excess salt.
Fluvaquents.				
82, 83, 84 Shellcreek	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
85*:				
Sobson	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Fair: depth to rock, small stones, thin layer.
Pepton	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones.
Edlin	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
86 Space City	Good	Probable	Improbable: too sandy.	Poor: too sandy.
87 Space City	Fair: slope.	Probable	Improbable: too sandy.	Poor: too sandy, slope.
88, 89, 90 Vonason	Good	Probable	Improbable: too sandy.	Poor: too sandy, small stones.
91*:				
Vonason	Good	Probable	Improbable: too sandy.	Poor: too sandy, small stones.
Cotopaxi	Good	Probable	Improbable: too sandy.	Poor: too sandy, slope.
92*:				
Worfman	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones.

See footnote at end of table.

TABLE 7.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
92*:				
Diamondville---------	Poor: depth to rock, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: depth to rock, too clayey, small stones.
93*. Pits				

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 8.--WATER MANAGEMENT

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Limitations for--		Features affecting--	
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation
50-----Bosler	Severe: seepage.	Severe: seepage.	Deep to water	Soil blowing.
51*:				
Bosler	Severe: seepage.	Severe: seepage.	Deep to water	Soil blowing.
Hooper	Severe: seepage.	Severe: seepage, piping, excess sodium.	Deep to water	Droughty.
52*:				
Clowers	Moderate: seepage.	Severe: piping.	Deep to water	Erodes easily.
Debone	Severe: seepage.	Severe: piping, excess sodium.	Deep to water	Percs slowly.
Edlin	Severe: seepage.	Severe: piping.	Deep to water	Soil blowing.
53*:				
Debone	Severe: seepage.	Severe: piping, excess sodium.	Deep to water	Percs slowly.
Shellcreek Variant	Slight	Severe: excess salt.	Deep to water	Droughty, slow intake, percs slowly.
54*:				
Debone Variant	Slight	Severe: excess sodium.	Deep to water	Percs slowly, excess sodium.
Shellcreek Variant	Slight	Severe: excess salt.	Deep to water	Droughty, percs slowly.
55*:				
Diamondville	Moderate: seepage, depth to rock.	Severe: thin layer.	Deep to water	Soil blowing, depth to rock.
Forelle	Moderate: seepage.	Severe: piping.	Deep to water	Soil blowing.
56-----Edlin	Severe: seepage.	Severe: piping.	Deep to water	Soil blowing.
57-----Edlin	Severe: seepage.	Severe: piping.	Deep to water	Slope, soil blowing.

See footnote at end of table.

TABLE 8.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Limitations for-- Embankments, dikes, and levees	Features affecting-- Drainage	Features affecting-- Irrigation
58*:				
Edlin	Severe: seepage.	Severe: piping.	Deep to water	Slope, soil blowing.
Cotopaxi	Severe: seepage, slope.	Severe: seepage, piping.	Deep to water	Droughty, fast intake, soil blowing.
59*:				
Edlin	Severe: seepage, slope.	Severe: piping.	Deep to water	Slope, soil blowing.
Huguston	Severe: depth to rock, slope.	Severe: piping.	Deep to water	Slope, soil blowing, depth to rock.
60 Elk Mountain	Severe: seepage.	Severe: piping.	Deep to water	Droughty.
61 Elk Mountain	Severe: seepage.	Severe: piping.	Deep to water	Slope, droughty.
62, 63, 64 Farson	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty, soil blowing.
65*:				
Farson	Severe: seepage, slope.	Severe: seepage, piping.	Deep to water	Slope, droughty, soil blowing.
Means	Severe: seepage, slope.	Severe: seepage, piping.	Deep to water	Slope, droughty.
66 Farson Variant	Severe: seepage.	Severe: seepage.	Deep to water	Droughty, excess salt.
68 Forelle	Moderate: seepage.	Severe: piping.	Deep to water	Soil blowing.
69*:				
Forelle	Moderate: seepage, slope.	Severe: piping.	Deep to water	Slope, soil blowing.
Diamondville	Moderate: seepage, depth to rock, slope.	Severe: thin layer.	Deep to water	Slope, soil blowing, depth to rock.
70 Gunbarrel	Severe: seepage.	Severe: seepage, piping, wetness.	Cutbanks cave, excess salt.	Wetness, droughty, fast intake.

See footnote at end of table.

TABLE 8.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--	
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation
71----------------- Haterton	Severe: depth to rock.	Severe: thin layer.	Deep to water----------	Slope, depth to rock.
72*:				
Haterton, thin solum-----------	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water----------	Slope, depth to rock.
Haterton----------	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water----------	Slope, depth to rock.
73*:				
Hooper-----------	Severe: seepage.	Severe: seepage, piping, excess sodium.	Deep to water----------	Droughty.
Hooper, overblown	Severe: seepage.	Severe: seepage, piping, excess sodium.	Deep to water----------	Droughty, fast intake.
74----------------- Kandaly	Severe: seepage, slope.	Severe: seepage, piping.	Deep to water----------	Slope, droughty, fast intake.
75*:				
Kandaly----------	Severe: seepage, slope.	Severe: seepage, piping.	Deep to water----------	Slope, droughty, fast intake.
Youjay-----------	Severe: depth to rock.	Severe: excess sodium.	Deep to water----------	Slope, percs slowly.
76----------------- Littlebear	Severe: seepage.	Severe: seepage, piping.	Deep to water----------	Droughty, fast intake.
77*, 78*:				
Means------------	Severe: seepage.	Severe: seepage, piping.	Deep to water----------	Droughty.
Farson-----------	Severe: seepage.	Severe: seepage, piping.	Deep to water----------	Droughty, soil blowing.
79----------------- Means Variant	Severe: seepage.	Severe: seepage, piping.	Deep to water----------	Droughty, soil blowing, depth to rock.
80*:				
Mishak-----------	Moderate: seepage.	Severe: wetness, excess sodium, excess salt.	Frost action, excess salt.	Wetness, droughty.

See footnote at end of table.

TABLE 8.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--	
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation
80*:				
Mishak Variant	Severe: seepage.	Severe: seepage, wetness, excess sodium.	Flooding, frost action, cutbanks cave.	Wetness, droughty, soil blowing.
81*:				
Quealman	Severe: seepage.	Severe: piping.	Cutbanks cave	Wetness, soil blowing.
Fluvaquents.				
82, 83, 84 Shellcreek	Slight	Moderate: hard to pack, excess salt.	Deep to water	Droughty, slow intake, percs slowly.
85*:				
Sobson	Severe: seepage.	Severe: piping.	Deep to water	Slope, soil blowing.
Pepton	Severe: depth to rock.	Severe: seepage.	Deep to water	Slope, soil blowing, depth to rock.
Edlin	Severe: seepage.	Severe: piping.	Deep to water	Slope, soil blowing.
86 Space City	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty, fast intake.
87 Space City	Severe: seepage, slope.	Severe: seepage, piping.	Deep to water	Slope, droughty, fast intake.
88, 89 Vonason	Severe: seepage.	Severe: seepage.	Deep to water	Droughty, fast intake.
90 Vonason	Severe: seepage.	Severe: seepage.	Deep to water	Slope, droughty, fast intake.
91*:				
Vonason	Severe: seepage.	Severe: seepage.	Deep to water	Droughty, fast intake.
Cotopaxi	Severe: seepage, slope.	Severe: seepage, piping.	Deep to water	Droughty, fast intake, soil blowing.
92*:				
Worfman	Severe: depth to rock.	Severe: thin layer.	Deep to water	Slope, soil blowing, depth to rock.
Diamondville	Moderate: seepage, depth to rock, slope.	Severe: thin layer.	Deep to water	Slope, soil blowing, depth to rock.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 9.--ENGINEERING INDEX PROPERTIES

(The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated)

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
50---------------Bosler	0-10	Sandy loam-------	SM	A-4	0	80-100	75-100	55-85	35-50	20-30	NP-5
	10-26	Loam, clay loam	CL-ML, CL	A-4, A-6	0	80-100	75-100	65-80	50-70	25-35	5-15
	26-60	Sand, coarse sand	SP, SP-SM	A-3, A-2	0	75-100	75-100	50-70	0-10	---	NP
51*:											
Bosler----------	0-5	Sandy loam-------	SM	A-4	0	80-100	75-100	55-85	35-50	20-30	NP-5
	5-20	Loam, clay loam	CL-ML, CL	A-4, A-6	0	80-100	75-100	65-80	50-70	25-35	5-15
	20-60	Sand-------------	SP, SP-SM	A-3, A-2	0	75-100	75-100	50-70	0-10	---	NP
Hooper----------	0-2	Clay loam--------	CL	A-6	0	100	100	90-100	70-95	30-50	10-20
	2-18	Clay, clay loam, gravelly clay loam.	CL, CH	A-6, A-7	0	75-100	70-100	60-100	50-95	35-60	15-35
	18-28	Sandy clay loam, sandy loam.	SC, SM, SM-SC	A-2, A-4, A-6	0-5	100	100	60-90	30-50	20-35	NP-15
	28-60	Sand, gravelly sand, very gravelly sand.	SM, SP-SM, GM, GP-GM	A-1, A-3, A-2	0-5	50-100	40-100	25-70	5-20	---	NP
52*:											
Clowers---------	0-12	Loam-------------	CL-ML, ML	A-4	0-5	80-100	80-100	80-90	60-75	25-35	5-10
	12-60	Stratified sandy loam to clay loam.	CL-ML, CL	A-4, A-6	0-5	80-100	75-100	65-90	50-75	25-40	5-15
Debone----------	0-2	Clay loam--------	CL	A-6	0	75-100	75-100	70-90	65-75	35-40	15-20
	2-13	Clay-------------	CL, CH	A-7	0	75-100	75-100	70-90	65-90	45-65	20-35
	13-60	Fine sandy loam	SM	A-4	0	75-100	75-100	65-85	35-50	20-25	NP-5
Edlin-----------	0-3	Fine sandy loam	SM	A-2	0	90-100	75-100	55-75	25-35	20-30	NP-5
	3-46	Fine sandy loam, sandy loam.	SM	A-2	0	90-100	75-100	55-75	25-35	20-30	NP-5
	46-60	Loamy sand, loamy fine sand.	SM	A-2	0	90-100	75-100	55-80	15-30	---	NP
53*:											
Debone----------	0-2	Clay loam--------	CL	A-6	0	75-100	75-100	70-90	65-75	35-40	15-20
	2-13	Clay-------------	CL, CH	A-7	0	75-100	75-100	70-90	65-90	45-65	20-35
	13-60	Fine sandy loam	SM	A-4	0	75-100	75-100	65-85	35-50	20-25	NP-5
Shellcreek Variant--------	0-2	Silty clay-------	CL, CH	A-7	0	100	100	90-100	70-95	40-55	20-30
	2-24	Silty clay, silty clay loam.	CL, CH	A-7	0	100	100	95-100	90-95	40-55	20-30
	24-50	Clay loam, silty clay.	CL, CH	A-7, A-6	0	100	100	90-100	70-95	35-55	15-30
	50-60	Loam, clay loam	CL	A-6, A-7	0	100	100	85-100	60-80	30-45	10-20
54*:											
Debone Variant--	0-1	Silty clay loam	CL	A-6, A-7	0	95-100	95-100	95-100	85-95	35-45	15-25
	1-4	Silty clay, clay loam, silty clay loam.	CL, CH	A-7	0	95-100	95-100	90-100	70-90	40-55	20-30
	4-60	Silty clay, clay loam, clay.	CL, CH	A-7	0	95-100	95-100	90-100	70-90	40-55	20-30

See footnote at end of table.

TABLE 9.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
54*:											
Shellcreek Variant	0-2	Silty clay loam	CL, CH	A-7	0	100	100	90-100	70-95	40-55	20-30
	2-24	Silty clay, silty clay loam.	CL, CH	A-7	0	100	100	95-100	90-95	40-55	20-30
	24-50	Clay loam, silty clay.	CL, CH	A-7, A-6	0	100	100	90-100	70-95	35-55	15-30
	50-60	Loam, clay loam	CL	A-6, A-7	0	100	100	85-100	60-80	30-45	10-20
55*:											
Diamondville	0-3	Sandy loam	SM	A-2	0-5	95-100	90-100	55-75	20-30	---	NP
	3-10	Clay loam, loam, sandy clay loam.	CL	A-6	0-5	95-100	90-100	85-95	70-80	30-40	10-20
	10-36	Loam	CL-ML, ML	A-4	0-5	95-100	90-100	85-95	60-75	20-30	NP-10
	36	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Forelle	0-3	Sandy loam	SM	A-4	0-10	85-100	85-100	65-80	40-50	20-25	NP-5
	3-22	Loam, sandy clay loam, clay loam.	CL-ML, CL	A-4, A-6	0-10	85-100	85-100	75-100	55-75	25-35	5-15
	22-60	Sandy loam	SM	A-2	0-10	85-100	85-100	50-65	20-30	---	NP
56, 57 Edlin	0-4	Fine sandy loam	SM	A-2	0	90-100	75-100	55-75	25-35	20-30	NP-5
	4-60	Fine sandy loam, sandy loam.	SM	A-2	0	90-100	75-100	55-75	25-35	20-30	NP-5
58*:											
Edlin	0-2	Fine sandy loam	SM	A-2	0	90-100	75-100	55-75	25-35	20-30	NP-5
	2-60	Fine sandy loam, sandy loam.	SM	A-2	0	90-100	75-100	55-75	25-35	20-30	NP-5
Cotopaxi	0-24	Fine sand	SP-SM, SM	A-3, A-2	0	90-100	80-100	70-80	5-15	---	NP
	24-60	Sand, fine sand, loamy fine sand.	SP-SM, SM	A-3, A-2	0	85-100	75-100	70-80	5-15	---	NP
59*:											
Edlin	0-1	Fine sandy loam	SM	A-2	0	90-100	75-100	55-75	25-35	20-30	NP-5
	1-60	Fine sandy loam, sandy loam.	SM	A-2	0	90-100	75-100	55-75	25-35	20-30	NP-5
Huguston	0-15	Sandy loam	SM	A-2, A-4	0	75-100	75-100	55-75	30-40	---	NP
	15	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
60 Elk Mountain	0-3	Sandy loam	SM	A-2	0	75-100	75-100	60-80	20-30	20-25	NP-5
	3-11	Fine sandy loam, loam.	SM	A-2, A-4	0	75-100	75-100	60-70	30-45	---	NP
	11-35	Gravelly sandy loam, channery sandy loam.	SM, GM	A-1, A-2	0	55-80	50-75	40-60	15-25	20-25	NP-5
	35	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
61 Elk Mountain	0-3	Sandy loam	SM	A-2	0	75-100	75-100	60-80	20-30	20-25	NP-5
	3-11	Fine sandy loam, loam.	SM	A-2, A-4	0	75-100	75-100	60-70	30-45	---	NP
	11-35	Gravelly sandy loam.	SM, GM	A-1, A-2	0	55-80	50-75	40-60	15-25	20-25	NP-5
	35	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 9.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
62, 63 Farson	0-8	Sandy loam	SM	A-2	0	80-100	75-100	55-75	25-35	---	NP-5
	8-17	Sandy loam, fine sandy loam.	SM-SC, SM	A-2, A-4	0	80-100	75-100	60-80	30-40	20-30	NP-10
	17-19	Gravelly sandy loam, gravelly fine sandy loam.	SM	A-2	0	75-80	70-75	55-70	20-30	---	NP
	19-60	Gravelly sand, sand, coarse sand.	SM, SP-SM	A-2, A-3	0	65-100	55-100	50-65	5-15	---	NP
64 Farson	0-6	Sandy loam	SM-SC	A-2, A-4, A-1	0	90-100	75-100	45-75	20-40	15-25	5-10
	6-14	Sandy loam	SM-SC	A-2, A-4, A-1	0	90-100	75-100	45-75	20-40	15-25	5-10
	14-60	Loamy coarse sand, coarse sand, gravelly sand.	SM, SP-SM	A-1, A-2, A-3	0	75-100	50-100	20-80	5-20	---	NP
65*: Farson	0-5	Sandy loam	SM	A-2	0	80-100	75-100	55-75	25-35	---	NP-5
	5-13	Sandy loam, fine sandy loam.	SM-SC, SM	A-2, A-4	0	80-100	75-100	60-80	30-40	20-30	NP-10
	13-60	Gravelly sand, sand, loamy sand.	SM, SP-SM	A-2, A-3	0	65-100	55-100	50-65	5-15	---	NP
Means	0-3	Sandy loam	SM	A-2, A-1	0	90-100	75-100	40-60	20-30	---	NP
	3-16	Sandy loam, very fine sandy loam.	SM	A-2, A-4	0	90-100	75-100	65-90	25-40	20-25	NP-5
	16-37	Gravelly sand, loamy sand.	SM, SP-SM	A-1, A-2	0	70-100	50-100	40-60	10-25	---	NP
	37	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
66 Farson Variant	0-7	Gravelly sandy loam.	SM	A-1, A-2	0	80-100	60-75	35-55	15-25	15-20	NP-5
	7-18	Gravelly sandy loam.	SM-SC	A-2, A-1	0	80-100	60-75	35-75	20-35	20-25	5-10
	18-60	Stratified loamy sand to gravelly sand.	SP-SM, SM	A-1, A-2, A-3	0	65-95	60-90	35-55	5-20	---	NP
67. Fluvaquents											
68 Forelle	0-3	Sandy loam	SM	A-4	0-10	85-100	85-100	65-80	40-50	20-25	NP-5
	3-18	Clay loam, loam, sandy clay loam.	CL	A-6	0-10	85-100	85-100	80-100	50-80	25-35	10-15
	18-60	Sandy loam	SM	A-2	0-10	85-100	85-100	50-65	20-30	---	NP
69*: Forelle	0-3	Sandy loam	SM	A-4	0-10	85-100	85-100	65-80	40-50	20-25	NP-5
	3-22	Clay loam, loam, sandy clay loam.	CL	A-6	0-10	85-100	85-100	80-100	50-80	25-35	10-15
	22-60	Sandy loam	SM	A-2	0-10	85-100	85-100	50-65	20-30	---	NP

See footnote at end of table.

TABLE 9.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
69*:											
Diamondville----	0-3	Sandy loam-------	SM	A-2	0-5	95-100	90-100	55-75	20-30	---	NP
	3-11	Clay loam, loam, sandy clay loam.	CL	A-6	0-5	95-100	90-100	85-95	70-80	30-40	10-20
	11-36	Loam-------------	CL-ML, ML	A-4	0-5	95-100	90-100	85-95	60-75	20-30	NP-10
	36	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
70--------------- Gunbarrel	0-60	Loamy sand-------	SM	A-2	0	95-100	80-100	50-75	15-30	---	NP
71--------------- Haterton	0-17	Loam-------------	CL-ML	A-4	0	75-100	75-100	70-100	50-70	25-30	5-10
	17	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
72*:											
Haterton, thin solum----------	0-7	Channery loam----	GM, GM-GC,	A-4	0	50-75	50-75	45-70	40-50	20-30	NP-10
	7	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Haterton--------	0-6	Loam-------------	CL-ML	A-4	0	75-100	75-100	70-100	50-70	25-30	5-10
	6-16	Channery loam----	SM, GM, SM-SC, GM-GC	A-4	0	50-75	50-75	45-70	40-50	20-30	NP-10
	16	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
73*:											
Hooper----------	0-2	Clay loam--------	CL	A-6	0	100	100	90-100	70-95	30-40	10-20
	2-18	Clay, clay loam, gravelly clay loam.	CL, CH	A-6, A-7	0	75-100	70-100	60-100	50-95	35-60	15-35
	18-28	Sandy clay loam, sandy loam.	SC, SM, SM-SC	A-2, A-4, A-6	0-5	100	100	60-90	30-50	20-35	NP-15
	28-60	Sand, gravelly sand, very gravelly sand.	SM, SP-SM, GM, GP-GM	A-1, A-3, A-2	0-5	50-100	40-100	25-70	5-20	---	NP
Hooper, overblown------	0-9	Loamy fine sand	SM	A-2	0	100	95-100	70-80	15-25	---	NP
	9-20	Clay, clay loam, gravelly clay loam.	CL, CH	A-6, A-7	0	75-100	70-100	60-100	50-95	35-60	15-35
	20-39	Sandy clay loam, sandy loam.	SC, SM, SM-SC	A-2, A-4, A-6	0-5	100	100	60-90	30-50	20-35	NP-15
	39-60	Sand, gravelly sand, very gravelly sand.	SM, SP-SM, GM, GP-GM	A-1, A-3, A-2	0-5	50-100	40-100	25-70	5-20	---	NP
74--------------- Kandaly	0-22	Fine sand--------	SM, SP-SM	A-2, A-3	0	100	100	75-90	5-30	---	NP
	22-60	Fine sand, loamy sand.	SM, SP-SM	A-2, A-3	0	100	100	75-90	5-30	---	NP
75*:											
Kandaly---------	0-60	Loamy fine sand	SM	A-2	0	100	100	75-95	20-35	---	NP

See footnote at end of table.

TABLE 9.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
75*:											
Youjay----------	0-1	Clay loam--------	CL	A-6	0	90-100	90-100	80-90	70-80	35-40	15-20
	1-5	Clay loam, silty clay loam, clay.	CL	A-7	0	90-100	90-100	75-90	70-85	40-50	15-25
	5-10	Very shaly clay loam, clay loam, loam.	CL	A-6	0	90-100	90-100	60-85	50-70	30-35	10-15
	10	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
76-------------- Littlebear	0-2	Loamy sand-------	SM	A-2	0-5	90-100	85-95	55-75	20-30	---	NP
	2-22	Sandy loam-------	SM	A-2, A-4	0-5	90-100	85-95	60-80	25-40	20-25	NP-5
	22-60	Loamy sand-------	SM	A-2	0-20	85-95	80-90	50-75	15-25	---	NP
77*:											
Means-----------	0-3	Sandy loam-------	SM	A-2, A-1	0	90-100	75-100	40-60	20-30	---	NP
	3-17	Sandy loam, very fine sandy loam.	SM	A-2, A-4	0	90-100	75-100	65-90	25-40	20-25	NP-5
	17-27	Loamy coarse sand, gravelly sandy loam.	SM	A-2	0	70-100	50-100	35-60	25-35	---	NP
	27-38	Gravelly sand, loamy sand.	SM, SP-SM	A-1, A-2	0	70-100	50-100	40-60	10-25	---	NP
	38	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Farson----------	0-3	Sandy loam-------	SM	A-2, A-1	0	90-100	75-100	45-70	20-35	20-25	NP-5
	3-17	Sandy loam-------	SM-SC, SM	A-2, A-4	0	90-100	75-100	50-75	20-40	20-30	NP-10
	17-45	Gravelly sand, sand.	SM, SP-SM	A-2, A-3, A-1	0	75-100	50-100	40-70	5-20	---	NP
	45	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Means-----------	0-3	Sandy loam-------	SM	A-2, A-1	0	90-100	75-100	40-60	20-30	---	NP
	3-17	Sandy loam, very fine sandy loam.	SM	A-2, A-4	0	90-100	75-100	65-90	25-40	20-25	NP-5
	17-27	Loamy coarse sand, gravelly sandy loam.	SM	A-2	0	70-100	50-100	35-60	25-35	---	NP
	27-38	Gravelly sand, loamy sand.	SM, SP-SM	A-1, A-2	0	70-100	50-100	40-60	10-25	---	NP
	38	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Farson----------	0-3	Sandy loam-------	SM	A-2	0	80-100	75-100	55-75	25-35	---	NP-5
	3-17	Sandy loam, fine sandy loam.	SM-SC, SM	A-2, A-4	0	80-100	75-100	60-80	30-40	20-30	NP-10
	17-45	Gravelly sand, sand.	SM, SP-SM	A-2, A-3	0	65-100	55-100	50-65	5-15	---	NP
	45	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
79-------------- Means Variant	0-13	Sandy loam-------	SM-SC, SC	A-2, A-4, A-1	0	90-100	75-100	45-75	20-40	15-25	5-10
	13-24	Loamy sand, loamy coarse sand.	SM	A-2, A-1	0	90-100	75-100	40-75	15-30	---	NP
	24-39	Gravelly sand, sand.	SP, SM, SP-SM	A-1, A-2, A-3	0	80-100	50-100	30-60	0-20	---	NP
	39	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 9.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
80*:											
Mishak----------	0-5	Fine sandy loam	SM	A-4	0-5	95-100	90-100	75-90	35-50	20-25	NP-5
	5-9	Stratified clay loam to sandy clay loam.	CL	A-6	0-10	95-100	90-100	75-95	50-75	30-40	10-20
	9-60	Stratified sandy loam to clay loam.	SC, CL	A-6	0-10	95-100	90-100	75-95	35-60	30-40	10-20
Mishak Variant--	0-1	Sandy loam-------	SM	A-2	0	100	100	50-70	15-25	---	NP
	1-8	Sandy clay loam	SC	A-6	0	100	100	55-80	40-50	30-35	10-15
	8-27	Sandy clay loam	SC	A-6	0	100	100	55-80	40-50	30-40	10-20
	27-37	Loamy sand-------	SM	A-1, A-2	0	100	100	40-60	15-25	---	NP
	37-60	Gravelly loamy sand.	SM	A-1	0	60-80	50-75	30-45	10-20	---	NP
81*:											
Quealman--------	0-12	Fine sandy loam	SM	A-2, A-4	0	75-100	75-100	50-75	25-50	---	NP
	12-60	Stratified loamy sand to loam.	SM	A-2, A-4	0	75-100	75-100	50-75	25-50	---	NP
Fluvaquents.											
82, 83, 84------- Shellcreek	0-3	Silty clay-------	CL, CH	A-7	0	100	100	95-100	90-95	45-65	25-35
	3-20	Silty clay, silty clay loam, clay.	CL, CH	A-7	0	100	100	95-100	90-95	40-65	20-35
	20-24	Silty clay, silty clay loam, clay.	CL, CH	A-7	0	100	100	95-100	90-95	40-65	20-35
	24-60	Silty clay, silty clay loam, clay.	CL, CH	A-7	0	100	100	95-100	90-95	40-65	20-35
85*:											
Sobson----------	0-2	Sandy loam-------	SM	A-2	0	100	100	75-95	25-35	---	NP
	2-12	Fine sandy loam, sandy loam.	SM	A-2	0	90-100	90-100	55-75	25-35	20-25	NP-5
	12-35	Fine sandy loam, sandy loam.	SM	A-2	0-5	90-100	90-100	55-75	25-35	20-25	NP-5
	35	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Pepton----------	0-3	Sandy loam-------	SM	A-2	0-5	80-100	75-100	55-75	25-35	20-25	NP-5
	3-11	Sandy loam, fine sandy loam.	SM	A-2	0-5	80-100	75-100	55-75	25-35	20-25	NP-5
	11-15	Channery sandy loam.	SM, GM	A-2, A-1	0-5	55-80	50-75	35-55	15-25	20-25	NP-5
	15	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Edlin-----------	0-4	Fine sandy loam	SM	A-2	0	90-100	75-100	55-75	25-35	20-30	NP-5
	4-60	Fine sandy loam, sandy loam.	SM	A-2	0	90-100	75-100	55-75	25-35	20-30	NP-5
86--------------- Space City	0-16	Loamy sand-------	SM	A-2, A-4	0	100	95-100	80-95	20-40	---	NP
	16-60	Loamy fine sand, loamy sand, sand.	SM, SP-SM	A-2, A-4, A-3	0	100	95-100	75-90	5-40	---	NP

See footnote at end of table.

TABLE 9.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
87--------------- Space City	0-10	Loamy sand-------	SM	A-2, A-4	0	100	95-100	80-95	20-40	---	NP
	10-60	Loamy fine sand, loamy sand, sand.	SM, SP-SM	A-2, A-4, A-3	0	100	95-100	75-90	5-40	---	NP
88, 89----------- Vonason	0-3	Loamy sand-------	SM	A-2	0	100	95-100	60-70	20-30	---	NP
	3-19	Sandy loam-------	SM	A-2	0	100	95-100	60-80	15-25	15-25	NP-5
	19-60	Gravelly loamy sand, loamy sand, sand.	SM, SP-SM	A-1, A-2, A-3	0	80-100	50-90	40-70	5-30	---	NP
90--------------- Vonason	0-2	Loamy sand-------	SM	A-2	0	100	95-100	60-70	20-30	---	NP
	2-15	Sandy loam-------	SM	A-2	0	100	95-100	60-80	15-25	15-25	NP-5
	15-60	Gravelly loamy sand, loamy sand, sand.	SM, SP-SM	A-1, A-2, A-3	0	80-100	50-90	40-70	5-30	---	NP
91*:											
Vonason---------	0-5	Loamy sand-------	SM	A-2	0	100	95-100	60-70	20-30	---	NP
	5-20	Sandy loam-------	SM	A-2	0	100	95-100	60-80	15-25	15-25	NP-5
	20-60	Gravelly loamy sand, loamy sand, sand.	SM, SP-SM	A-1, A-2, A-3	0	80-100	50-90	40-70	5-30	---	NP
Cotopaxi--------	0-8	Fine sand--------	SP-SM, SM	A-3, A-2	0	90-100	80-100	70-80	5-15	---	NP
	8-60	Sand, fine sand	SP-SM, SM	A-3, A-2	0	85-100	75-100	70-80	5-15	---	NP
92*:											
Worfman---------	0-3	Sandy loam-------	SM-SC	A-2	0	85-100	85-100	55-65	25-35	20-30	5-10
	3-14	Loam, clay loam, sandy clay loam.	CL	A-6	0	85-100	85-100	70-90	50-75	30-40	10-20
	14	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Diamondville----	0-2	Sandy loam-------	SM	A-2	0-5	95-100	90-100	55-75	20-30	---	NP
	2-20	Clay loam, loam, sandy clay loam.	CL	A-6	0-5	95-100	90-100	85-95	70-80	30-40	10-20
	20-32	Loam-------------	CL-ML, ML	A-4	0-5	95-100	90-100	85-95	60-75	20-30	NP-10
	32	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
93*. Pits											

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 10.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

(The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated)

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
50---------------Bosler	0-10	10-20	1.25-1.35	2.0-6.0	0.13-0.15	6.6-7.8	<2	Low-------	0.28	2	3	.5-1
	10-26	15-30	1.25-1.40	0.6-2.0	0.17-0.20	7.4-8.4	<2	Moderate	0.37			
	26-60	0-5	1.40-1.60	2.0-6.0	0.05-0.07	7.4-8.4	<2	Low-------	0.15			
51*:												
Bosler----------	0-5	10-20	1.25-1.35	2.0-6.0	0.13-0.15	6.6-7.8	<2	Low-------	0.28	2	3	.5-1
	5-20	15-30	1.25-1.40	0.6-2.0	0.17-0.20	7.4-8.4	<2	Moderate	0.37			
	20-60	0-5	1.40-1.60	2.0-6.0	0.05-0.07	7.4-8.4	<2	Low-------	0.15			
Hooper----------	0-2	27-40	1.15-1.25	0.6-2.0	0.19-0.21	8.5-9.0	<4	Low-------	0.32	3	4L	.5-1
	2-18	35-55	1.30-1.40	<0.06	0.04-0.06	>9.0	4-8	High------	0.37			
	18-28	12-30	1.40-1.50	0.6-6.0	0.04-0.06	8.5-9.0	>8	Low-------	0.24			
	28-60	0-5	1.60-1.70	6.0-20	0.03-0.05	8.5-9.0	<4	Low-------	0.05			
52*:												
Clowers---------	0-12	20-27	1.15-1.25	0.6-2.0	0.16-0.18	7.9-9.0	<4	Low-------	0.37	5	4L	.5-1
	12-60	18-35	1.30-1.40	0.6-2.0	0.16-0.18	7.9-9.0	<4	Low-------	0.49			
Debone----------	0-2	28-35	1.15-1.25	0.6-2.0	0.18-0.20	7.9-9.0	2-4	Moderate	0.37	5	4L	.5-1
	2-13	40-60	1.15-1.30	0.06-0.2	0.11-0.13	7.9-9.0	<4	High------	0.32			
	13-60	5-15	1.35-1.50	2.0-6.0	0.10-0.12	7.9-9.0	2-4	Low-------	0.32			
Edlin-----------	0-3	10-18	1.25-1.35	2.0-6.0	0.12-0.14	6.6-7.8	<2	Low-------	0.32	5	3	.5-1
	3-46	10-18	1.35-1.45	2.0-6.0	0.12-0.14	7.4-8.4	<4	Low-------	0.37			
	46-60	0-10	1.45-1.55	2.0-6.0	0.07-0.09	7.4-8.4	<4	Low-------	0.28			
53*:												
Debone----------	0-2	28-35	1.15-1.25	0.6-2.0	0.18-0.20	7.9-9.0	2-4	Moderate	0.37	5	4L	.5-1
	2-13	40-60	1.15-1.30	0.06-0.2	0.11-0.13	7.9-9.0	<4	High------	0.32			
	13-60	5-15	1.35-1.50	2.0-6.0	0.10-0.12	7.9-9.0	4-8	Low-------	0.32			
Shellcreek Variant--------	0-2	35-50	1.10-1.20	0.06-0.2	0.04-0.10	>8.4	>16	High------	0.32	5	4	.5-1
	2-24	35-50	1.15-1.25	0.06-0.2	0.04-0.10	>8.4	8-16	High------	0.37			
	24-50	30-50	1.20-1.30	0.06-0.2	0.10-0.15	7.9-8.4	<16	High------	0.37			
	50-60	20-40	1.25-1.35	0.2-0.6	0.13-0.18	7.9-8.4	<8	Moderate	0.37			
54*:												
Debone Variant--	0-1	27-35	1.05-1.15	0.2-0.6	0.19-0.21	7.4-9.0	<4	High------	0.43	5	4	.5-1
	1-4	35-50	1.15-1.25	0.06-0.2	0.16-0.20	>8.4	<4	High------	0.49			
	4-60	35-50	1.15-1.25	0.06-0.2	0.12-0.15	>7.8	<8	High------	0.49			
Shellcreek Variant--------	0-2	35-50	1.10-1.20	0.06-0.2	0.04-0.10	>8.4	>16	High------	0.32	5	4	.5-1
	2-24	35-50	1.15-1.25	0.06-0.2	0.04-0.10	7.9-8.4	8-16	High------	0.37			
	24-50	30-50	1.20-1.30	0.06-0.2	0.10-0.15	7.9-8.4	<16	High------	0.37			
	50-60	20-40	1.25-1.35	0.2-0.6	0.13-0.18	7.9-8.4	<8	Moderate	0.37			
55*:												
Diamondville----	0-3	5-15	1.25-1.35	2.0-6.0	0.11-0.13	6.6-7.8	<2	Low-------	0.32	2	3	.5-1
	3-10	18-35	1.25-1.35	0.2-0.6	0.16-0.18	6.6-8.4	<2	Moderate	0.49			
	10-36	10-25	1.25-1.35	0.6-2.0	0.16-0.18	7.9-9.0	<2	Low-------	0.49			
	36	---	---	---	---	---	---	----------	----			

See footnote at end of table.

TABLE 10.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink- swell potential	Erosion factors K	Erosion factors T	Wind erodi- bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
55*:												
Forelle---------	0-3	15-20	1.25-1.35	2.0-6.0	0.13-0.15	6.6-8.4	<2	Low--------	0.28	5	3	.5-1
	3-22	18-30	1.25-1.35	0.6-2.0	0.16-0.18	7.4-8.4	<2	Low--------	0.37			
	22-60	5-15	1.35-1.45	2.0-6.0	0.11-0.12	7.9-9.0	<2	Low--------	0.37			
56, 57----------- Edlin	0-4	10-18	1.25-1.35	2.0-6.0	0.12-0.14	6.6-7.8	<2	Low--------	0.32	5	3	.5-1
	4-60	10-18	1.35-1.45	2.0-6.0	0.12-0.14	7.4-8.4	<4	Low--------	0.37			
58*:												
Edlin-----------	0-2	10-18	1.25-1.35	2.0-6.0	0.12-0.14	6.6-7.8	<2	Low--------	0.32	5	3	.5-1
	2-60	10-18	1.35-1.45	2.0-6.0	0.12-0.14	7.4-8.4	<4	Low--------	0.37			
Cotopaxi--------	0-24	2-6	1.45-1.55	6.0-20	0.04-0.06	7.4-7.8	<2	Low--------	0.10	5	1	<.5
	24-60	2-6	1.45-1.55	6.0-20	0.04-0.06	7.4-7.8	<2	Low--------	0.10			
59*:												
Edlin-----------	0-1	10-18	1.25-1.35	2.0-6.0	0.12-0.14	6.6-7.8	<2	Low--------	0.32	5	3	.5-1
	1-60	10-18	1.35-1.45	2.0-6.0	0.12-0.14	7.4-8.4	<4	Low--------	0.37			
Huguston--------	0-15	5-12	1.25-1.35	2.0-6.0	0.13-0.15	7.4-8.4	2-4	Low--------	0.32	1	3	.5-1
	15	---	---	---	---	---	---	-----------	----			
60--------------- Elk Mountain	0-3	5-15	1.25-1.35	2.0-6.0	0.12-0.14	6.6-7.8	<2	Low--------	0.32	3	3	.5-1
	3-11	4-10	1.30-1.40	2.0-6.0	0.09-0.12	7.9-9.0	<2	Low--------	0.37			
	11-35	5-15	1.25-1.35	2.0-6.0	0.06-0.11	7.9-9.0	<2	Low--------	0.15			
	35	---	---	---	---	---	---	-----------	----			
61--------------- Elk Mountain	0-3	5-15	1.25-1.35	2.0-6.0	0.12-0.14	6.6-7.8	<2	Low--------	0.32	3	3	.5-1
	3-11	4-10	1.30-1.40	2.0-6.0	0.09-0.12	7.9-9.0	<2	Low--------	0.37			
	11-35	5-15	1.25-1.35	2.0-6.0	0.06-0.11	7.9-9.0	<2	Low--------	0.15			
	35	---	---	---	---	---	---	-----------	----			
62, 63----------- Farson	0-8	8-15	1.25-1.35	2.0-6.0	0.12-0.14	6.6-7.8	<2	Low--------	0.32	5	3	.5-1
	8-17	11-18	1.35-1.45	2.0-6.0	0.12-0.14	6.6-7.8	<2	Low--------	0.32			
	17-19	5-12	1.35-1.45	2.0-6.0	0.08-0.11	7.4-8.4	<4	Low--------	0.17			
	19-60	0-5	1.45-1.55	6.0-20	0.03-0.06	7.4-8.4	<4	Low--------	0.05			
64--------------- Farson	0-6	8-15	1.25-1.35	2.0-6.0	0.08-0.12	7.9-8.4	<4	Low--------	0.28	5	3	.5-1
	6-14	10-18	1.35-1.45	0.6-2.0	0.09-0.13	7.4-7.8	<4	Low--------	0.32			
	14-60	2-8	1.55-1.65	6.0-20	0.04-0.06	7.4-8.4	<4	Low--------	0.10			
65*:												
Farson----------	0-5	8-15	1.25-1.35	2.0-6.0	0.12-0.14	6.6-7.8	<2	Low--------	0.32	5	3	.5-1
	5-13	11-18	1.35-1.45	2.0-6.0	0.12-0.14	6.6-7.8	<2	Low--------	0.32			
	13-60	0-5	1.45-1.55	6.0-20	0.03-0.06	7.4-8.4	<4	Low--------	0.05			
Means-----------	0-3	6-17	1.25-1.35	2.0-6.0	0.11-0.13	6.6-7.8	<2	Low--------	0.24	2	3	.5-1
	3-16	10-18	1.35-1.45	0.6-2.0	0.12-0.16	6.6-7.8	<2	Low--------	0.32			
	16-37	0-8	1.45-1.55	6.0-20	0.03-0.07	7.4-8.4	<4	Low--------	0.10			
	37	---	---	---	---	---	---	-----------	----			
66--------------- Farson Variant	0-7	8-15	1.25-1.35	2.0-6.0	0.02-0.04	7.9-9.0	4-16	Low--------	0.20	5	8	.5-1
	7-18	12-18	1.35-1.45	0.6-2.0	0.07-0.09	7.9-9.0	<4	Low--------	0.24			
	18-60	0-6	1.45-1.55	6.0-20	0.03-0.07	7.4-8.4	<4	Low--------	0.10			
67. Fluvaquents												

See footnote at end of table.

TABLE 10.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink- swell potential	Erosion factors K	Erosion factors T	Wind erodi- bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
68---------------- Forelle	0-3	15-20	1.25-1.35	2.0-6.0	0.13-0.15	6.6-8.4	<2	Low--------	0.28	5	3	.5-1
	3-18	18-35	1.25-1.35	0.6-2.0	0.16-0.21	6.6-8.4	<2	Moderate	0.37			
	18-60	5-15	1.35-1.45	2.0-6.0	0.11-0.12	7.9-9.0	<2	Low--------	0.37			
69*:												
Forelle----------	0-3	15-20	1.25-1.35	2.0-6.0	0.13-0.15	6.6-8.4	<2	Low--------	0.28	5	3	.5-1
	3-22	18-35	1.25-1.35	0.6-2.0	0.16-0.21	6.6-8.4	<2	Moderate	0.37			
	22-60	5-15	1.35-1.45	2.0-6.0	0.11-0.12	7.9-9.0	<2	Low--------	0.37			
Diamondville-----	0-3	5-15	1.25-1.35	2.0-6.0	0.11-0.13	6.6-7.8	<2	Low--------	0.32	2	3	.5-1
	3-11	18-35	1.25-1.35	0.2-0.6	0.16-0.18	6.6-8.4	<2	Moderate	0.49			
	11-36	10-25	1.25-1.35	0.6-2.0	0.16-0.18	7.9-9.0	<2	Low--------	0.49			
	36	---	---	---	---	---	---	-----------	----			
70---------------- Gunbarrel	0-60	0-7	1.50-1.55	6.0-20	0.06-0.08	7.9-9.0	4-16	Low--------	0.10	5	2	<1
71---------------- Haterton	0-17	18-27	1.25-1.35	0.6-2.0	0.16-0.18	7.9-9.0	2-4	Low--------	0.37	1	4L	.5-1
	17	---	---	---	---	---	---	-----------	----			
72*:												
Haterton, thin solum-----------	0-7	10-20	1.25-1.35	0.6-2.0	0.09-0.13	7.9-9.0	2-4	Low--------	0.15	1	8	.5-1
	7	---	---	---	---	---	---	-----------	----			
Haterton---------	0-6	18-27	1.25-1.35	0.6-2.0	0.16-0.18	7.9-9.0	2-4	Low--------	0.37	1	4L	.5-1
	6-16	10-18	1.35-1.45	0.6-2.0	0.09-0.13	7.9-9.0	2-4	Low--------	0.17			
	16	---	---	---	---	---	---	-----------	----			
73*:												
Hooper-----------	0-2	27-40	1.30-1.40	<0.06	0.04-0.06	>8.4	4-8	Moderate	0.28	3	4	.5-1
	2-18	35-55	1.30-1.40	<0.06	0.04-0.06	>9.0	4-8	High-------	0.37			
	18-28	12-30	1.40-1.50	0.6-6.0	0.04-0.06	>8.4	>8	Low--------	0.24			
	28-60	0-5	1.60-1.70	6.0-20	0.03-0.05	>8.4	<4	Low--------	0.05			
Hooper, overblown-------	0-9	0-5	1.50-1.60	2.0-6.0	0.06-0.08	>8.4	<4	Low--------	0.17	3	2	.5-1
	9-20	35-55	1.30-1.40	<0.06	0.04-0.06	>8.4	4-8	High-------	0.37			
	20-39	12-30	1.40-1.50	0.6-6.0	0.04-0.06	>8.4	>8	Low--------	0.24			
	39-60	0-5	1.60-1.70	6.0-20	0.03-0.05	>8.4	<4	Low--------	0.05			
74---------------- Kandaly	0-22	0-7	1.35-1.45	6.0-20	0.05-0.07	7.4-8.4	<2	Low--------	0.28	5	1	<.5
	22-60	0-7	1.45-1.60	6.0-20	0.05-0.07	7.4-8.4	<2	Low--------	0.28			
75*:												
Kandaly----------	0-60	0-10	1.35-1.45	6.0-20	0.08-0.10	7.4-8.4	<2	Low--------	0.32	5	2	<.5
Youjay-----------	0-1	28-35	1.15-1.25	0.2-0.6	0.19-0.21	>8.4	2-4	Moderate	0.32	1	6	.5-1
	1-5	35-45	1.20-1.30	0.06-0.2	0.15-0.20	>8.4	2-4	High-------	0.37			
	5-10	24-30	1.25-1.35	0.2-0.6	0.17-0.20	>8.4	2-4	Moderate	0.43			
	10	---	---	---	---	---	---	-----------	----			
76---------------- Littlebear	0-2	0-10	1.35-1.45	6.0-20	0.06-0.08	>7.8	<8	Low--------	0.10	5	2	<1
	2-22	5-15	1.35-1.45	2.0-6.0	0.09-0.13	>7.8	<8	Low--------	0.15			
	22-60	0-10	1.45-1.55	6.0-20	0.06-0.08	>7.8	<8	Low--------	0.10			

See footnote at end of table.

TABLE 10.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink- swell potential	Erosion factors K	Erosion factors T	Wind erodi- bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
77*:												
Means-----------	0-3	6-17	1.25-1.35	2.0-6.0	0.11-0.13	6.6-7.8	<2	Low--------	0.24	2	3	.5-1
	3-17	10-18	1.35-1.45	0.6-2.0	0.12-0.16	6.6-7.8	<2	Low--------	0.32			
	17-27	5-12	1.40-1.50	2.0-6.0	0.06-0.12	7.4-8.4	<4	Low--------	0.20			
	27-38	0-8	1.45-1.55	6.0-20	0.03-0.07	7.4-8.4	<4	Low--------	0.10			
	38	---	---	---	---	---	---	-----------	----			
Farson----------	0-3	8-15	1.25-1.35	2.0-6.0	0.09-0.12	6.6-7.8	<2	Low--------	0.28	3	3	.5-1
	3-17	10-18	1.35-1.45	0.6-2.0	0.09-0.12	6.6-7.8	<2	Low--------	0.32			
	17-45	0-8	1.45-1.55	6.0-20	0.04-0.06	7.4-8.4	<2	Low--------	0.10			
	45	---	---	---	---	---	---	-----------	----			
78*:												
Means-----------	0-3	6-17	1.25-1.35	2.0-6.0	0.11-0.13	6.6-7.8	<2	Low--------	0.24	2	3	.5-1
	3-17	10-18	1.35-1.45	0.6-2.0	0.12-0.16	6.6-7.8	<2	Low--------	0.32			
	17-27	5-12	1.40-1.50	2.0-6.0	0.06-0.12	7.4-8.4	<4	Low--------	0.20			
	27-38	0-8	1.45-1.55	6.0-20	0.03-0.07	7.4-8.4	<4	Low--------	0.10			
	38	---	---	---	---	---	---	-----------	----			
Farson----------	0-3	8-15	1.25-1.35	2.0-6.0	0.12-0.14	6.6-7.8	<2	Low--------	0.32	5	3	.5-1
	3-17	11-18	1.35-1.45	2.0-6.0	0.12-0.14	6.6-7.8	<2	Low--------	0.32			
	17-45	0-5	1.45-1.55	6.0-20	0.03-0.06	7.4-8.4	<4	Low--------	0.05			
	45	---	---	---	---	---	---	-----------	----			
79--------------- Means Variant	0-13	8-18	1.50-1.60	0.6-2.0	0.09-0.13	7.4-9.0	<16	Low--------	0.20	2	3	.5-1
	13-24	4-8	1.60-1.70	2.0-6.0	0.06-0.07	7.4-8.4	<4	Low--------	0.20			
	24-39	1-6	1.60-1.70	6.0-20	0.05-0.06	7.4-8.4	<4	Low--------	0.10			
	39	---	---	---	---	---	---	-----------	----			
80*:												
Mishak----------	0-5	10-20	1.30-1.40	2.0-6.0	0.08-0.11	>8.4	>8	Low--------	0.20	5	3	1-2
	5-9	18-35	---	0.6-2.0	0.08-0.11	7.9-9.0	>8	Moderate	0.24			
	9-60	15-30	---	0.6-2.0	0.13-0.15	7.9-9.0	8-16	Moderate	0.24			
Mishak Variant--	0-1	5-15	1.25-1.35	2.0-6.0	0.02-0.04	>8.4	>4	Low--------	0.28	5	3	.5-1
	1-8	20-25	1.15-1.25	0.6-2.0	0.03-0.05	>8.4	>4	Moderate	0.32			
	8-27	20-35	1.25-1.35	0.6-2.0	0.07-0.09	7.9-9.0	2-8	Moderate	0.37			
	27-37	0-5	1.45-1.55	6.0-20	0.06-0.08	8.5-9.0	<4	Low--------	0.20			
	37-60	0-5	1.45-1.55	6.0-20	0.04-0.06	7.9-9.0	<4	Low--------	0.10			
81*:												
Quealman--------	0-12	5-13	1.25-1.35	2.0-6.0	0.11-0.15	7.9-9.0	4-8	Low--------	0.32	5	3	<.8
	12-60	5-13	1.35-1.45	2.0-6.0	0.11-0.15	7.9-9.0	4-8	Low--------	0.37			
Fluvaquents.												
82, 83, 84------- Shellcreek	0-3	40-60	1.05-1.15	0.06-0.2	0.11-0.13	7.9-9.0	2-8	High-------	0.37	5	4	<1
	3-20	35-60	1.15-1.25	0.06-0.2	0.11-0.13	>7.8	2-8	High-------	0.43			
	20-24	35-60	1.15-1.25	0.06-0.2	0.11-0.13	>7.8	4-8	High-------	0.43			
	24-60	35-60	1.15-1.25	0.06-0.2	0.07-0.09	>7.8	4-16	High-------	0.43			
85*:												
Sobson----------	0-2	5-10	1.25-1.35	2.0-6.0	0.13-0.15	6.6-7.8	<2	Low--------	0.32	3	3	.5-1
	2-12	10-18	1.35-1.45	2.0-6.0	0.12-0.14	6.6-7.8	<2	Low--------	0.37			
	12-35	10-18	1.35-1.45	2.0-6.0	0.12-0.14	7.9-9.0	<4	Low--------	0.37			
	35	---	---	---	---	---	---	-----------	----			
Pepton----------	0-3	5-18	1.25-1.35	2.0-6.0	0.12-0.14	7.4-7.8	<2	Low--------	0.32	1	3	.5-1
	3-11	5-18	1.35-1.45	2.0-6.0	0.12-0.14	7.4-7.8	<2	Low--------	0.37			
	11-15	5-18	1.35-1.45	2.0-6.0	0.06-0.08	7.4-8.4	<2	Low--------	0.15			
	15	---	---	---	---	---	---	-----------	----			

See footnote at end of table.

TABLE 10.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink- swell potential	Erosion factors		Wind erodi- bility group	Organic matter
									K	T		
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
85*:												
Edlin-----------	0-4	10-18	1.25-1.35	2.0-6.0	0.12-0.14	6.6-7.8	<2	Low--------	0.32	5	3	.5-1
	4-60	10-18	1.35-1.45	2.0-6.0	0.12-0.14	7.4-8.4	<4	Low--------	0.37			
86--------------- Space City	0-16	4-8	1.35-1.45	6.0-20	0.07-0.10	7.9-8.4	<2	Low--------	0.15	5	2	<.5
	16-60	2-7	1.55-1.65	6.0-20	0.04-0.08	>7.4	<2	Low--------	0.10			
87--------------- Space City	0-10	4-8	1.35-1.45	6.0-20	0.07-0.10	7.9-8.4	<2	Low--------	0.15	5	2	<.5
	10-60	2-7	1.55-1.65	6.0-20	0.04-0.08	>7.4	<2	Low--------	0.10			
88, 89----------- Vonason	0-3	3-6	1.35-1.45	6.0-20	0.06-0.08	6.6-7.8	<2	Low--------	0.20	5	2	.5-1
	3-19	7-14	1.35-1.45	2.0-6.0	0.11-0.13	6.6-7.8	<2	Low--------	0.32			
	19-60	2-8	1.45-1.55	6.0-20	0.04-0.07	7.4-8.4	<2	Low--------	0.15			
90--------------- Vonason	0-2	3-6	1.35-1.45	6.0-20	0.06-0.08	6.6-7.8	<2	Low--------	0.20	5	2	.5-1
	2-15	7-14	1.35-1.45	2.0-6.0	0.11-0.13	6.6-7.8	<2	Low--------	0.32			
	15-60	2-8	1.45-1.55	6.0-20	0.04-0.07	7.4-8.4	<2	Low--------	0.15			
91*:												
Vonason---------	0-5	3-6	1.35-1.45	6.0-20	0.06-0.08	6.6-7.8	<2	Low--------	0.20	5	2	.5-1
	5-20	7-14	1.35-1.45	2.0-6.0	0.11-0.13	6.6-7.8	<2	Low--------	0.32			
	20-60	2-8	1.45-1.55	6.0-20	0.04-0.07	7.4-8.4	<2	Low--------	0.15			
Cotopaxi--------	0-8	2-6	1.45-1.55	6.0-20	0.04-0.06	7.4-7.8	<2	Low--------	0.10	5	1	<.5
	8-60	2-6	1.45-1.55	6.0-20	0.04-0.06	7.4-7.8	<2	Low--------	0.10			
92*:												
Worfman---------	0-3	10-20	1.25-1.35	2.0-6.0	0.11-0.13	6.6-7.8	<2	Low--------	0.24	1	3	.5-1
	3-14	18-35	1.25-1.35	0.6-2.0	0.15-0.19	6.6-9.0	<2	Moderate	0.32			
	14	---	---	---	---	---	---	-----------	----			
Diamondville----	0-2	5-15	1.25-1.35	2.0-6.0	0.11-0.13	6.6-7.8	<2	Low--------	0.32	2	3	.5-1
	2-20	18-35	1.25-1.35	0.2-0.6	0.16-0.18	6.6-8.4	<2	Moderate	0.49			
	20-32	10-25	1.25-1.35	0.6-2.0	0.16-0.18	7.9-9.0	<2	Low--------	0.49			
	32	---	---	---	---	---	---	-----------	----			
93*. Pits												

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 11.--SOIL AND WATER FEATURES

("Flooding" and "water table" and terms such as "rare," "brief," "apparent," and "perched" are explained in the text. The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern or that data were not estimated)

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
50----------------- Bosler	B	None---------	---	---	>6.0	---	---	>60	---	Low-------	High------	Low.
51*:												
Bosler-----------	B	None---------	---	---	>6.0	---	---	>60	---	Low-------	High------	Low.
Hooper-----------	D	None---------	---	---	4.0-6.0	Apparent	Jun-Sep	>60	---	Low-------	High------	Low.
52*:												
Clowers----------	B	Rare---------	---	---	>6.0	---	---	>60	---	Low-------	High------	Low.
Debone-----------	D	Rare---------	---	---	>6.0	---	---	>60	---	Low-------	High------	High.
Edlin------------	B	None---------	---	---	>6.0	---	---	>60	---	Low-------	High------	Low.
53*:												
Debone-----------	D	Rare---------	---	---	>6.0	---	---	>60	---	Low-------	High------	High.
Shellcreek Variant----------	D	Rare---------	---	---	4.0-5.0	Apparent	Apr-May	>60	---	Moderate	High------	High.
54*:												
Debone Variant---	D	Rare---------	---	---	>6.0	---	---	>60	---	Moderate	High------	Moderate.
Shellcreek Variant----------	D	Rare---------	---	---	4.0-5.0	Apparent	Apr-May	>60	---	Moderate	High------	High.
55*:												
Diamondville-----	C	None---------	---	---	>6.0	---	---	20-40	Soft	Low-------	High------	Low.
Forelle----------	B	None---------	---	---	>6.0	---	---	>60	---	Low-------	High------	Low.
56, 57------------ Edlin	B	None---------	---	---	>6.0	---	---	>60	---	Low-------	High------	Low.
58*:												
Edlin------------	B	None---------	---	---	>6.0	---	---	>60	---	Low-------	High------	Low.
Cotopaxi---------	A	None---------	---	---	>6.0	---	---	>60	---	Low-------	Moderate	Low.
59*:												
Edlin------------	B	None---------	---	---	>6.0	---	---	>60	---	Low-------	High------	Low.
Huguston---------	D	None---------	---	---	>6.0	---	---	10-20	Soft	Low-------	High------	Low.

See footnote at end of table.

TABLE 11.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table: Depth	High water table: Kind	High water table: Months	Bedrock: Depth	Bedrock: Hardness	Potential frost action	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete
					Ft			In				
60, 61----------- Elk Mountain	B	None--------	---	---	>6.0	---	---	20-40	Soft	Low------	High-----	Low.
62, 63----------- Farson	B	None--------	---	---	>6.0	---	---	>60	---	Low------	High-----	Low.
64--------------- Farson	C	None--------	---	---	3.0-4.0	Perched	Jun-Sep	>60	---	Low------	High-----	Moderate.
65*:												
Farson-----------	B	None--------	---	---	>6.0	---	---	>60	---	Low------	High-----	Low.
Means------------	C	None--------	---	---	>6.0	---	---	20-40	Soft	Low------	High-----	Low.
66--------------- Farson Variant	B	None--------	---	---	3.0-5.0	Perched	Jun-Sep	>60	---	Moderate	High-----	Moderate.
67. Fluvaquents												
68--------------- Forelle	B	None--------	---	---	>6.0	---	---	>60	---	Low------	High-----	Low.
69*:												
Forelle----------	B	None--------	---	---	>6.0	---	---	>60	---	Low------	High-----	Low.
Diamondville-----	C	None--------	---	---	>6.0	---	---	20-40	Soft	Low------	High-----	Low.
70--------------- Gunbarrel	D	None--------	---	---	1.0-2.0	Apparent	Apr-Aug	>60	---	Moderate	High-----	Low.
71--------------- Haterton	D	None--------	---	---	>6.0	---	---	10-20	Soft	Low------	High-----	Low.
72*:												
Haterton, thin solum-----------	D	None--------	---	---	>6.0	---	---	4-10	Soft	Low------	High-----	Low.
Haterton---------	D	None--------	---	---	>6.0	---	---	10-20	Soft	Low------	High-----	Low.
73*:												
Hooper-----------	D	None--------	---	---	4.0-6.0	Apparent	Jun-Sep	>60	---	Low------	High-----	Low.
Hooper, overblown	D	None--------	---	---	4.0-6.0	Apparent	Jun-Sep	>60	---	Low------	High-----	Low.
74--------------- Kandaly	A	None--------	---	---	>6.0	---	---	>60	---	Low------	High-----	Low.
75*:												
Kandaly----------	A	None--------	---	---	>6.0	---	---	>60	---	Low------	High-----	Low.

See footnote at end of table.

TABLE 11.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
75*:												
Youjay-----------	D	None--------	---	---	>6.0	---	---	10-15	Soft	Low------	High-----	Moderate.
76---------------- Littlebear	B	None--------	---	---	>6.0	---	---	>60	---	Low------	High-----	Low.
77*:												
Means------------	C	None--------	---	---	>6.0	---	---	20-40	Soft	Low------	High-----	Low.
Farson-----------	B	None--------	---	---	>6.0	---	---	40-60	Soft	Low------	High-----	Low.
78*:												
Means------------	C	None--------	---	---	>6.0	---	---	20-40	Soft	Low------	High-----	Low.
Farson-----------	B	None--------	---	---	>6.0	---	---	>60	---	Low------	High-----	Low.
79---------------- Means Variant	B	None--------	---	---	>3.0	Perched	Jun-Aug	30-40	Soft	Moderate	High-----	Moderate.
80*:												
Mishak-----------	D	None--------	---	---	1.0-3.0	Apparent	Jun-Aug	>60	---	High-----	High-----	Moderate.
Mishak Variant---	C	Occasional	Brief-----	Mar-Jun	1.0-3.0	Apparent	Apr-Aug	>60	---	High-----	High-----	High.
81*:												
Quealman---------	C	Rare--------	---	---	2.0-3.5	Apparent	May-Sep	>60	---	Moderate	High-----	Moderate.
Fluvaquents.												
82, 83, 84-------- Shellcreek	C	Rare--------	---	---	>6.0	---	---	>60	---	Low------	High-----	Moderate.
85*:												
Sobson-----------	C	None--------	---	---	>6.0	---	---	20-40	Hard	Low------	High-----	Low.
Pepton-----------	D	None--------	---	---	>6.0	---	---	10-20	Hard	Low------	High-----	Low.
Edlin------------	B	None--------	---	---	>6.0	---	---	>60	---	Low------	High-----	Low.
86, 87----------- Space City	A	None--------	---	---	>6.0	---	---	>60	---	Low------	High-----	Low.
88, 89, 90-------- Vonason	B	None--------	---	---	>6.0	---	---	>60	---	Low------	High-----	Low.
91*:												
Vonason----------	B	None--------	---	---	>6.0	---	---	>60	---	Low------	High-----	Low.
Cotopaxi---------	A	None--------	---	---	>6.0	---	---	>60	---	Low------	Moderate	Low.

See footnote at end of table.

TABLE 11.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
92*:												
Worfman----------	D	None--------	---	---	>6.0	---	---	10-20	Soft	Low------	High-----	Low.
Diamondville-----	C	None--------	---	---	>6.0	---	---	20-40	Soft	Low------	High-----	Low.
93*. Pits												

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--CLASSIFICATION OF THE SOILS

Soil name	Family or higher taxonomic class
Bosler	Fine-loamy over sandy or sandy-skeletal, mixed Borollic Haplargids
Clowers	Fine-loamy, mixed (calcareous), frigid Typic Torrifluvents
Cotopaxi	Mixed, frigid Typic Torripsamments
Debone	Fine, montmorillonitic, frigid Typic Natrargids
Debone Variant	Fine, montmorillonitic, frigid Typic Natrargids
Diamondville	Fine-loamy, mixed Borollic Haplargids
Edlin	Coarse-loamy, mixed Borollic Camborthids
Elk Mountain	Coarse-loamy, mixed Borollic Haplargids
Farson	Coarse-loamy, mixed Borollic Haplargids
Farson Variant	Coarse-loamy, mixed, frigid Aquic Haplargids
Forelle	Fine-loamy, mixed Borollic Haplargids
Gunbarrel	Mixed, frigid Typic Psammaquents
Haterton	Loamy, mixed (calcareous), frigid, shallow Typic Torriorthents
Hooper	Clayey over sandy or sandy-skeletal, montmorillonitic, frigid Typic Natrargids
Huguston	Loamy, mixed (calcareous), frigid, shallow Typic Torriorthents
Kandaly	Mixed, frigid Typic Torripsamments
Littlebear	Sandy, mixed, frigid Typic Torriorthents
Means	Coarse-loamy, mixed Borollic Haplargids
Means Variant	Coarse-loamy, mixed, frigid Aquic Haplargids
Mishak	Fine-loamy, mixed (calcareous), frigid Typic Halaquepts
Mishak Variant	Fine-loamy over sandy or sandy-skeletal, mixed (calcareous), frigid Typic Halaquepts
Pepton	Loamy, mixed Borollic Lithic Camborthids
Quealman	Coarse-loamy, mixed (calcareous), frigid Typic Torrifluvents
Shellcreek	Fine, montmorillonitic, frigid Typic Camborthids
Shellcreek Variant	Fine, montmorillonitic (calcareous), frigid Typic Torriorthents
Sobson	Coarse-loamy, mixed Borollic Camborthids
Space City	Mixed, frigid Typic Torripsamments
Vonason	Sandy, mixed Borollic Camborthids
Worfman	Loamy, mixed, shallow Borollic Haplargids
Youjay	Clayey, montmorillonitic, frigid, shallow Typic Natrargids

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