SOIL SURVEY OF

Big Horn County Area, Montana

United States Department of Agriculture
Soil Conservation Service
and
United States Department of the Interior
Bureau of Indian Affairs
In cooperation with
Montana Agricultural Experiment Station

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

Major fieldwork for this soil survey was completed in the period 1962-70. Soil names and descriptions were approved in 1970. Unless otherwise indicated, statements in the publication refer to conditions in the Area in 1971. This survey was made cooperatively by the Soil Conservation Service; the Bureau of Indian Affairs, Missouri River Basin Investigations Project; and the Montana Agricultural Experiment Station. It is part of the technical assistance furnished to the Big Horn Conservation District.

HOW TO USE THIS SOIL SURVEY

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

Locating Soils

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

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

Finding and Using Information

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

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

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

Foresters and others can refer to the section "Use of the Soils for Windbreaks" and "Use of the Soils for Woodland," where the soils of the Area are grouped according to their suitability for trees.

Game managers, sportsmen, and others can find information about soils and wildlife in the section "Use of the Soils for Wildlife."

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

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

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

Newcomers in the Big Horn County Area may be especially interested in the section "General Soil Map," where broad patterns of soils are described. They may also be interested in the information about the Area given in the beginning of the publication and in the section "General Nature of the Area."

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SOIL SURVEY OF BIG HORN COUNTY AREA, MONTANA

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UNITED STATES DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE, AND UNITED STATES DEPARTMENT OF THE INTERIOR, BUREAU OF INDIAN AFFAIRS, IN COOPERATION WITH THE MONTANA AGRICULTURAL EXPERIMENT STATION

THE BIG HORN COUNTY AREA is in the unglaciated, semiarid high plains of extreme south-central Montana (fig. 1). It has an area of 3,042,595 acres, or about 4,754 square miles. The survey area includes all of Big Horn County except the part of the Cheyenne Indian Reservation in the extreme east-central part of the county. Hardin, the county seat, is near the center of the county, about 48 miles southeast of Billings.

General information about the Big Horn County Area can be found in the section "General Nature of the Area" at the back of this survey.

How This Survey Was Made

Soil scientists made this survey to learn what kinds of soil are in the Big Horn County Area, where they are located, and how they can be used. The soil scientists went into the Area knowing they likely would find many soils they had already seen and perhaps some they had not. They observed the steepness, length, and shape of slopes; the size and speed of streams; the kinds of native plants or crops; the kinds of rock; and many facts about the soils. They dug many holes to expose soil profiles. A profile is the sequence of natural layers, or horizons, in a soil; it extends from the surface down into the parent material that has not been changed much by leaching or by the action of plant roots.

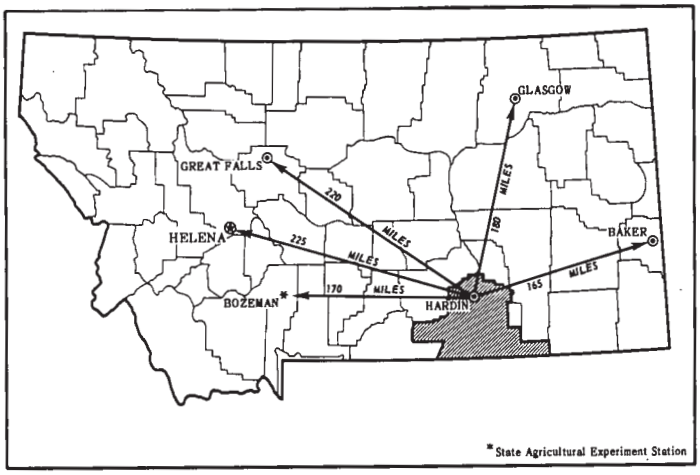

Figure 1.—**Location of the Big Horn County Area in Montana.**

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

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

Soils of one series can differ in texture of the surface layer and in slope, stoniness, or some other characteristic that affects use of the soils by man. On the basis of such differences, a soil series is divided into phases. The name of a soil phase indicates a feature that affects management. For example, Haverson loam, 2 to 4 percent slopes, is one of several phases within the Haverson series.

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

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

Some mapping units are made up of soils of different series or of different phases within one series. Three

such kinds of mapping units are shown on the soil map of the Big Horn County Area: soil complexes, soil associations, and undifferentiated groups.

A soil complex consists of areas of two or more soils, so intricately mixed or so small in size that they cannot be shown separately on the soil map. Each area of a complex contains some of each of the two or more dominant soils, and the pattern and relative proportions are about the same in all areas. Generally, the name of a soil complex consists of the names of the dominant soils, joined by a hyphen. Gilt Edge-Bone complex, 0 to 1 percent slopes, is an example.

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

An undifferentiated group is made up of two or more soils that could be delineated individually but are shown as one unit because, for the purpose of the soil survey, there is little value in separating them. The pattern and proportion of soils are not uniform. An area shown on the map may be made up of only one of the dominant soils or of two or more. Haverson and Lohmiller soils, channeled, is an undifferentiated group in this survey area.

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

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

Soil scientists observe how soils behave when used as a growing place for native and cultivated plants and as material for structures, foundations for structures, or covering for structures. They relate this behavior to properties of the soils. For example, they observe that filter fields for onsite disposal of sewage fail on a given kind of soil, and they relate this to the slow permeability of the soil or a high water table. They see that streets, road pavements, and foundations for houses are cracked on a named kind of soil, and they relate this failure to the high shrink-swell potential of the soil material. Thus, they use observation and knowledge of soil properties, together with available research data, to predict limitations or suitability of soils for present and potential uses.

After data have been collected and tested for the key, or benchmark, soils in a survey area, the soil scientists set up trial groups of soils. They test these groups by further study and by consultation with farmers, agronomists, engineers, and others. They then adjust the groups according to the results of their studies and consultation. Thus, the groups that are finally evolved reflect up-to-date knowledge of the soils and their behavior under current methods of use and management.

General Soil Map

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

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

The twenty-four soil associations in this survey have been grouped into six general kinds of landscapes for broad interpretative purposes. Each of the broad groups and the soil associations in each group are described in the following pages.

Soils Dominantly on Stream Terraces and Alluvial Fans

These soils are mainly on stream terraces and alluvial fans. They formed in alluvium. Average annual precipitation ranges from 12 to 17 inches, and the frost-free period is 95 to 125 days. The soils are used mostly for irrigated crops, but some areas are used for dryfarmed crops and range.

Two soil associations in the Big Horn County Area are on stream terraces and alluvial fans.

1. Kyle-Lohmiller-Haverson association

Deep, nearly level to steep, well-drained soils on flood plains, terraces, fans, and foot slopes

This association consists of mostly nearly level and gently sloping soils on flood plains, terraces, fans, and foot slopes. The soils are steep on the edges of terraces and on streambanks.

This association makes up about 4 percent of the Area. It is about 30 percent Kyle soils, 30 percent Lohmiller soils, 25 percent Haverson soils, and 15 percent other soils. These other soils are in the Glenberg, McRae, Thurlow, Nunn, and Vananda series.

Kyle soils, on fans, foot slopes, and terraces, are nearly level to strongly sloping. The surface layer typically is grayish-brown silty clay about 2 inches thick. The subsoil is olive-gray clay and silty clay. Pale-olive clay is at a depth of 12 inches.

Lohmiller soils, on flood plains, fans, and terraces, are level to steep. The surface layer typically is light brownish-gray silty clay loam about 12 inches thick. It is underlain by light yellowish-brown and pale-olive, stratified silty clay loam and silty clay.

Haverson soils, on low terraces and flood plains, are nearly level to steep. The surface layer typically is grayish-brown loam about 12 inches thick. It is underlain by light yellowish-brown and light brownish-gray, stratified silt loam, loam, and fine sandy loam.

The main concerns of management are localized protection from spring flooding, proper irrigation, control of erosion, and drainage of included wet areas.

The soils in this association are used mostly for irrigated crops, but river islands and low flood plains are used for range, and small areas above irrigation canals are used for dryfarmed crops. Corn, small grain, sugar beets, and hay grow well on all soils in this association, and dry beans grow well on the Haverson and McRae soils. The main farm enterprise is growing crops for cash and for feed for beef cattle.

2. *Korchea-Farnuf-Savage association*

Deep, nearly level to steep, well-drained soils on fans, foot slopes, flood plains, and terraces

This association consists of mostly nearly level to steep soils on flood plains, terraces, fans, and foot slopes.

This association makes up about 2 percent of the Area. It is about 40 percent Korchea soils, 20 percent Farnuf soils, 20 percent Savage soils, and 20 percent other soils. These soils are in the Shaak, Lennep, and Xavier series.

Korchea soils, on flood plains and fans, are nearly level to steep. The surface layer typically is grayish-brown loam about 9 inches thick. It is underlain by light brownish-gray loam and silt loam.

Farnuf soils, on fans, terraces, and foot slopes, are nearly level to sloping. The surface layer typically is very dark grayish-brown loam about 5 inches thick. The subsoil is grayish-brown and pale-brown loam and clay loam about 29 inches thick. It is underlain by light yellowish-brown loam.

Savage soils, on fans, terraces, and foot slopes, are nearly level to strongly sloping. The surface layer typically is dark grayish-brown silt loam about 2 inches thick. The subsoil is grayish-brown silty clay loam and silty clay about 21 inches thick. It is underlain by olive silty clay.

The main concerns of management are localized protection from spring flooding, proper irrigation, and control of erosion.

The soils in this association are used mostly for irrigated crops, but brushy areas on flood plains are used for pasture. Corn, sugar beets, small grain, and hay are the main crops grown. The main farm enterprises are growing crops for cash and growing hay and pasture for beef cattle.

Soils Dominantly on High Gravel Terraces, Fans, and Benches

These soils are on high gravel terraces, fans, and benches. They formed in alluvium and in material weathered from sandstone and shale. Average annual precipitation is 10 to 18 inches, and the frost-free period is 90 to 125 days. The soils are used mostly for range and dryfarmed crops, but some areas are used for irrigated crops. The native vegetation is mainly mid and short grasses.

Five soil associations in the Big Horn County Area are on high gravel terraces, fans, and benches.

3. *Judith-Danvers-Windham association*

Deep, nearly level to very steep and gently undulating to hilly, well-drained soils on fans, terraces, and benches

This association consists of mostly level to very steep and gently undulating to hilly soils on terraces, fans, and benches.

This association makes up about 1 percent of the Area. It is about 30 percent Judith soils, 25 percent Danvers soils, 20 percent Windham soils, and 25 percent other soils. These other soils are in the Shaak, Lennep, Norbert, Eltsac, Amherst, and Maginnis series.

Judith soils are nearly level to steep and gently undulating to hilly. The surface layer typically is dark grayish-brown loam about 2 inches thick. The subsoil is grayish-brown clay loam about 28 inches thick. It is underlain by pale-brown, light-gray, and white loam and gravelly loam.

Danvers soils are nearly level and gently undulating to hilly. The surface layer is dark grayish-brown loam about 3 inches thick. The subsoil is grayish-brown and light yellowish-brown silty clay and silty clay loam about 12 inches thick. It is underlain by pale-yellow, brown, and light yellowish-brown silty clay loam and loam.

Windham soils are undulating to very steep. The surface layer typically is dark grayish-brown gravelly loam about 5 inches thick. It is underlain by dark grayish-brown and light brownish-gray gravelly loam that grades to very pale brown very gravelly loam at a depth of about 14 inches.

The main concerns of management are localized protection from spring flooding and control of erosion.

The soils in this association are used mostly for small grain, but the hilly to very steep soils are used for range.

4. *Keiser-Hydro-Gilt Edge association*

Deep, nearly level to gently sloping and gently undulating, well-drained soils on terraces, fans, and benches

This association consists of nearly level to gently sloping and gently undulating soils on terraces, fans, and benches.

This association makes up about 3 percent of the Area. It is about 30 percent Keiser soils, 20 percent Hydro soils, 15 percent Gilt Edge soils, and 35 percent other soils. These other soils are in the Shonkin, Colby, Harvey, and Clapper series.

Keiser soils are nearly level to gently sloping and

gently undulating. The surface layer typically is light brownish-gray loam about 1 inch thick. The subsoil is brown loam and silty clay loam about 20 inches thick. It is underlain by light brownish-gray silt loam.

Hydro soils are nearly level and gently sloping. The surface layer typically is light brownish-gray very fine sandy loam about 2 inches thick, and the subsurface layer is brown loam about 3 inches thick. The subsoil is grayish-brown silty clay and silty clay loam about 22 inches thick. It is underlain by light brownish-gray and olive-gray silty clay loam, silty clay, and silt loam.

Gilt Edge soils are nearly level and gently undulating. The surface layer typically is light brownish-gray and grayish-brown loam and silt loam about 3 inches thick. The subsoil is grayish-brown clay and silty clay about 3 inches thick. It is underlain by pale-yellow silty clay and silty clay loam.

The main concerns of management are localized protection from spring flooding and control of erosion.

The soils in this association are used mostly for dryfarmed small grain. They are suitable for irrigation.

5. *Spearfish-Pultney-Stormitt association*

Shallow to deep, nearly level to very steep, well-drained soils on fans, benches, and sedimentary uplands

This association consists of nearly level to very steep soils on fans, benches, and sedimentary uplands.

This association makes up about 2 percent of the Area. It is about 25 percent Spearfish soils, 15 percent Pultney soils, 15 percent Stormitt soils, and 45 percent other soils and shale and limestone outcrops. These other soils are in the Terry, Travessilla, Harvey, and Chugter series.

Spearfish soils, on sedimentary uplands, are rolling to very steep. The surface layer typically is reddish-brown loam about 3 inches thick. It is underlain by red silty clay loam. Platy shale is at a depth of about 15 inches.

Pultney soils, on sedimentary uplands, are undulating to very steep. The surface layer typically is brown loam about 2 inches thick. The subsoil is brown loam about 4 inches thick. It is underlain by light-brown loam that grades to pink loam. Shale and sandstone are at a depth of about 30 inches.

Stormitt soils, on fans and benches, are nearly level to steep and hilly. The surface layer typically is brown loam about 4 inches thick. The subsoil is light-brown loam about 3 inches thick. It is underlain by light-brown loam that grades to pink loam and to very gravelly loam.

The main concerns of management are maintenance or improvement of rangeland vegetation and control of erosion.

The soils in this association are suited to range.

6. *Wayden-Xavier-Belfield association*

Shallow to deep, nearly level to very steep and gently undulating to hilly, well-drained soils on fans, terraces, foot slopes, benches, and sedimentary uplands

This association consists of mostly nearly level to very steep and gently undulating to hilly soils on fans, terraces, foot slopes, benches, and sedimentary uplands.

This association makes up about 6 percent of the Area. It is about 30 percent Wayden soils, 20 percent Xavier soils, 10 percent Belfield soils, and 40 percent other soils. These other soils are in the Eltsac, Norbert, Shaak, Reeder, and Lennep series.

Wayden soils, on sedimentary uplands, are strongly sloping and very steep and rolling to hilly. The surface layer typically is grayish-brown silty clay loam about 2 inches thick. The subsoil is grayish-brown silty clay loam about 5 inches thick. The underlying material is light brownish-gray silty clay loam. Clay shale is at a depth of about 19 inches.

Xavier soils, on fans, terraces, and benches, are gently undulating to rolling. The surface layer typically is grayish-brown silt loam about 4 inches thick. The subsoil is dark-brown and pale-brown silty clay loam about 11 inches thick. It is underlain by pale-yellow and light yellowish-brown silt loam.

Belfield soils, on fans, terraces, foot slopes, and sedimentary uplands, are nearly level and gently undulating. The surface layer typically is light brownish-gray silt loam about 2 inches thick, and the subsurface layer is light brownish-gray silt loam about 3 inches thick. The subsoil is brown, grayish-brown, and light yellowish-brown silty clay and silty clay loam about 22 inches thick. It is underlain by light yellowish-brown and pale-yellow silty clay and silty clay loam.

The main concerns of management are maintenance or improvement of rangeland vegetation and control of erosion.

The soils in this association are used mostly for range. The Xavier and Belfield soils in this association are well suited to small grain and hay.

7. *Beauvais association*

Deep, gently undulating to hilly, well-drained soils on terraces, fans, foot slopes, and loess-covered hills

This association consists of nearly level to steep and gently undulating to hilly soils on terraces, fans, and foot slopes.

This association makes up about 3 percent of the Area. It is about 40 percent Beauvais soils, 30 percent Colby soils, and 30 percent other soils and gravelly terrace edges. These other soils are in the Sofia, Gilt Edge, Shonkin, and Richfield series.

Beauvais soils are gently undulating to rolling. The surface layer typically is grayish-brown silty clay loam about 5 inches thick. The subsoil is brown silty clay about 4 inches thick. It is underlain by light-gray and light brownish-gray silty clay loam.

Colby soils are nearly level to moderately steep and gently undulating to hilly. The surface layer typically is grayish-brown silt loam about 5 inches thick. It is underlain by light brownish-gray silty clay loam.

The main concerns of management are localized protection from spring flooding, control of erosion, and maintenance or improvement of rangeland vegetation.

The soils in this association are used mostly for dryfarmed grain and range. Irrigated crops are also suited to these soils.

Soils on Sandstone Hills

These soils are on sandstone hills. They formed in alluvium and in material weathered from sandstone. Average annual precipitation ranges from 13 to 18 inches, and the frost-free period is 100 to 125 days. The soils are used mostly for range, but some areas are used for dryfarmed crops. The native vegetation is mainly mid and short grasses.

Two soil associations in the Big Horn County Area are on sandstone hills.

8. Nelson-Alice association

Moderately deep and deep, gently sloping to strongly sloping and undulating to rolling, well-drained soils on foot slopes, fans, valley bottoms, and sedimentary uplands

This association consists of gently sloping to strongly sloping and undulating to rolling soils on foot slopes, fans, valley bottoms, and sedimentary uplands.

This association makes up about 1 percent of the Area. It is about 55 percent Nelson soils, 25 percent Alice soils, and 20 percent other soils and Rock outcrop. These other soils are in the Travessilla, Thedalund, Tullock, and Terry series and are on sedimentary uplands.

Nelson soils, on sedimentary uplands, are undulating to rolling. The surface layer typically is light olive-brown and grayish-brown fine sandy loam about 5 inches thick. It is underlain by light olive-brown and light yellowish-brown sandy loam that grades to pale-yellow sandy loam. Sandstone is at a depth of about 29 inches.

Alice soils, on foot slopes, fans, and valley bottoms, are gently sloping to strongly sloping and rolling. The surface layer typically is grayish-brown fine sandy loam about 2 inches thick. The subsoil is grayish-brown and light olive-brown sandy loam about 10 inches thick. It is underlain by light olive-brown, light yellowish-brown, and pale-yellow sandy loam and loamy sand.

The main concerns of management are maintenance or improvement of rangeland vegetation and control of erosion.

The soils in this association are used mostly for range, but small areas are used for dryfarmed hay.

9. Dast-Vebar-Parshall association

Moderately deep and deep, undulating to hilly and strongly sloping to very steep, well-drained soils on foot slopes, fans, valley bottoms, and sedimentary uplands

This association consists of mostly rolling to very steep soils on foot slopes, fans, valley bottoms, and sedimentary uplands.

This association makes up about 1 percent of the Area. It is about 40 percent Dast soils, 15 percent Vebar soils, 10 percent Parshall soils, and 35 percent other soils. These other soils are in the Farnuf, Shaak, Wayden, and Doney series.

Dast soils, on sedimentary uplands, are rolling to very steep. The surface layer typically is grayish-brown sandy loam about 3 inches thick. It is underlain by light olive-brown and light yellowish-brown sandy loam. Sandstone is at a depth of about 24 inches.

Vebar soils, on sedimentary uplands, are undulating to hilly and steep. The surface layer typically is grayish-brown sandy loam about 2 inches thick. The subsoil is brown sandy loam and sandy clay loam about 25 inches thick. It is underlain by pale-yellow sandy loam. Sandstone is at a depth of about 40 inches.

Parshall soils, on foot slopes, fans, and valley bottoms, are strongly sloping and rolling. The surface layer typically is grayish-brown fine sandy loam about 2 inches thick. The subsoil is grayish-brown and dark-brown sandy loam about 17 inches thick. It is underlain by grayish-brown and light brownish-gray sandy loam and sandy clay loam.

The main concerns of management are maintenance or improvement of rangeland vegetation and control of erosion.

The soils in this association are used mostly for range, but small areas are used for dryfarmed small grain and hay. The main farm enterprise is raising beef cattle.

Soils on Dissected Shale Hills

These soils are on dissected shale hills. They formed in alluvium and in material weathered from shale, sandstone, and siltstone. Average annual precipitation is 11 to 17 inches, and the frost-free period is 90 to 125 days. The soils are used mostly for range, but in one association some of the soils are used for dryfarmed crops. The native vegetation is mainly mid and short grasses.

Eight soil associations in the Big Horn County are on dissected shale hills.

10. Pierre-Lismas-Kyle association

Shallow to deep, nearly level to very steep and gently undulating to hilly, well-drained soils on fans, foot slopes, terraces, and sedimentary uplands

This association consists of nearly level to very steep and gently undulating to hilly soils on fans, foot slopes, terraces, and sedimentary uplands.

This association makes up about 9 percent of the Area. It is about 35 percent Pierre soils, 30 percent Lismas soils, 15 percent Kyle soils, and 20 percent other soils and Shale outcrop. These other soils are in the Vananda, Allentine, Arvada, and Bone series.

Pierre soils, on sedimentary uplands, are gently undulating to hilly and steep. The surface layer typically is grayish-brown silty clay and clay about 3 inches thick. The subsoil is light brownish-gray clay about 3 inches thick. It is underlain by pale-olive clay. Clay shale is at a depth of about 29 inches.

Lismas soils, on sedimentary uplands, are undulating to hilly and steep. The surface layer typically is light olive-gray clay about 1 inch thick. It is underlain by light olive-gray clay. Clay shale is at a depth of about 18 inches.

Kyle soils, on terraces, fans, and foot slopes, are nearly level to strongly sloping. The surface layer typically is grayish-brown silty clay about 2 inches thick. The subsoil is olive-gray clay and silty clay about 8 inches thick. It is underlain by pale-olive clay.

The main concerns in management are localized protection from spring overflow, control of erosion, and maintenance or improvement of rangeland vegetation.

The soils in this association are used mostly for range, but the nearly level to sloping undulating Pierre and Kyle soils are also suited to dryfarmed small grain.

11. *Thedalund-Midway association*

Moderately deep and shallow, undulating to hilly and gently sloping to very steep, well-drained soils on sedimentary uplands

This association consists of undulating to hilly and gently sloping to very steep soils on sedimentary uplands.

This association makes up about 19 percent of the Area. It is about 30 percent Thedalund soils, 30 percent Midway soils, and 40 percent other soils, Shale outcrop and Rock outcrop (sandstone). These other soils are in the McRae, Fort Collins, Thurlow, Cushman, and Nelson series.

Thedalund soils are undulating to very steep. The surface layer typically is grayish-brown loam about 2 inches thick. It is underlain by olive-brown, light yellowish-brown, and light-gray loam. Shale is at a depth of about 28 inches.

Midway soils are undulating to hilly and gently sloping to steep. The surface layer typically is light olive-gray silty clay loam about 2 inches thick. It is underlain by olive-gray silty clay loam. Shale is at a depth of about 11 inches.

The main concerns of management are maintenance or improvement of rangeland vegetation and control of erosion.

The soils in this association are suited to range.

12. *Wibaux-Thedalund-Spearman association*

Shallow and moderately deep, undulating to very steep, well-drained to excessively drained soils on sedimentary uplands

This association consists of undulating to very steep soils on sedimentary uplands.

This association makes up about 5 percent of the Area. It is about 30 percent Wibaux soils, 20 percent Thedalund soils, 20 percent Spearman soils, and 30 percent other soils. These other soils are in the Nelson, Chugter, Cushman, Hydro, and McRae series.

Wibaux soils are undulating to very steep. The surface layer typically is reddish-brown channery loam about 2 inches thick. It is underlain by reddish-brown very channery loam. Shale and sandstone are at a depth of about 9 inches.

Thedalund soils are undulating to very steep. The surface layer typically is grayish-brown loam about 2 inches thick. It is underlain by olive-brown, light yellowish-brown, and light-gray loam. Shale is at a depth of about 28 inches.

Spearman soils are undulating to rolling. The surface layer typically is reddish-brown loam and clay loam about 4 inches thick. The subsoil is reddish-brown clay loam about 11 inches thick. It is underlain by light reddish-brown channery loam and loam. Shale is at a depth of about 23 inches.

The main concerns of management are maintenance or improvement of rangeland vegetation and control of erosion.

The soils in this association are used mostly for range. Coal mining has increased in this association.

13. *Ringling-Searing-Arnegard association*

Shallow to deep, gently sloping to very steep and undulating to hilly, well-drained soils on fans, foot slopes, and sedimentary uplands

This association consists of gently sloping to very steep and undulating to hilly soils on sedimentary uplands, fans, and foot slopes.

This association makes up about 8 percent of the Area. It is about 30 percent Ringling soils, 20 percent Searing soils, 15 percent Arnegard soils, and 35 percent other soils and Rock outcrop. These other soils are in the Farnuf, Savage, Reeder, Doney, and Grail series.

Ringling soils, on sedimentary uplands, are rolling to very steep. The surface layer typically is reddish-brown channery loam. It is underlain by reddish-brown very channery loam. Shale is at a depth of about 13 inches.

Searing soils, on sedimentary uplands, are undulating to hilly and steep. The surface layer typically is dark reddish-gray loam about 6 inches thick. The subsoil is reddish-brown loam and clay loam about 18 inches thick. It is underlain by red loam. Shale and sandstone are at a depth of about 30 inches.

Arnegard soils, on fans and foot slopes, are gently sloping to steep and hilly. The surface layer typically is very dark grayish-brown and very dark gray loam about 14 inches thick. The subsoil is dark grayish-brown clay loam about 17 inches thick. It is underlain by dark-brown clay loam and loam.

The main concerns of management are localized protection from flooding of dryfarmed crops, maintenance or improvement of rangeland vegetation, and control of erosion.

The soils in this association are used mostly for range, but some of the Arnegard soils are used for dryfarmed crops.

14. *Doney-Reeder-Wayden association*

Moderately deep and shallow, gently undulating to very steep, well-drained soils on sedimentary uplands

This association consists of gently undulating to very steep soils on sedimentary uplands.

This association makes up about 9 percent of the Area. It is about 30 percent Doney soils, 20 percent Reeder soils, 20 percent Wayden soils, and 30 percent other soils. These other soils are in the Farnuf, Shaak, Savage, and Dast series.

Doney soils are sloping and rolling to very steep. The surface layer typically is grayish-brown loam about 6 inches thick. It is underlain by light yellowish-brown and pale-yellow loam. Shale and sandstone are at a depth of about 24 inches.

Reeder soils are gently undulating to hilly. The surface layer typically is dark grayish-brown loam about 4 inches thick. It is underlain by pale-brown clay loam and loam. Shale and sandstone are at a depth of about 30 inches.

Wayden soils are strongly sloping to very steep and rolling to hilly. The surface layer typically is grayish-brown silty clay loam about 5 inches thick. The substratum is light brownish-gray silty clay loam. Shale is at a depth of about 19 inches.

The main concerns of management are maintenance or improvement of rangeland vegetation and control of erosion.

The soils in this association are used for range.

15. Midway-Nunn association

Shallow to deep, nearly level to steep and undulating to hilly, well-drained soils on terraces, fans, foot slopes, and sedimentary uplands

This association consists of nearly level to steep and undulating to hilly soils on terraces, fans, foot slopes, and sedimentary uplands.

This association makes up about 2 percent of the Area. It is about 45 percent Midway soils, 30 percent Nunn soils, and 25 percent other soils. These other soils are in the Thedalund, Heldt, and Pierre series.

Midway soils, on sedimentary uplands, are gently sloping to steep and undulating to hilly. The surface layer typically is light olive-gray silty clay loam about 2 inches thick. It is underlain by olive-gray silty clay loam. Shale is at a depth of about 11 inches.

Nunn soils, on fans, terraces, and foot slopes, are nearly level to moderately steep. The surface layer typically is grayish-brown silty clay loam about 8 inches thick. The subsoil is grayish-brown and light olive-brown silty clay and clay loam about 15 inches thick. It is underlain by stratified clay loam, silt loam, and sandy clay loam.

The main concerns of management are maintenance or improvement of rangeland vegetation and control of erosion.

The soils in this association are used mostly for range.

16. Wayden-Regent-Shale outcrop association

Shallow and moderately deep, gently undulating to hilly and strongly sloping to very steep, well-drained soils and Shale outcrop on sedimentary uplands

This association consists of gently undulating to hilly and strongly sloping to very steep soils and Shale outcrop on sedimentary uplands.

This association makes up about 4 percent of the Area. It is about 40 percent Wayden soils, 25 percent Regent soils, 15 percent Shale outcrop, and 20 percent other soils and Rock outcrop. These other soils are in the Lennep, Savage, Cherry, and Doney series.

Wayden soils are strongly sloping to very steep and rolling to hilly. The surface layer typically is grayish-brown silty clay loam about 2 inches thick. The subsoil is grayish-brown silty clay loam about 5 inches thick. It is underlain by light brownish-gray silty clay loam. Shale is at a depth of about 19 inches.

Regent soils are gently undulating to hilly and steep. The surface layer typically is grayish-brown silty clay loam about 3 inches thick. The subsoil is grayish-brown and pale-olive silty clay loam about 13 inches thick. It is underlain by light-gray silty clay loam. Shale is at a depth of about 26 inches.

The main concerns of management are maintenance or improvement of rangeland vegetation and control of erosion.

The soils in this association are mostly suited to range.

17. Midway association

Shallow and moderately deep, undulating to hilly and gently sloping to very steep, well-drained soils on sedimentary uplands

This association consists of undulating to hilly and gently sloping to very steep soils on sedimentary uplands.

This association makes up about 2 percent of the Area. It is about 35 percent Midway soils, 25 percent Thedalund soils, and 40 percent other soils. These other soils are in the Cushman, Terry, Nelson, Thurlow, McRae, Keiser, and Fort Collins series.

Midway soils are gently sloping to steep and undulating to hilly. The surface layer typically is light olive-gray silty clay loam about 2 inches thick. It is underlain by olive-gray silty clay loam. Shale is at a depth of about 11 inches.

Thedalund soils are undulating to very steep. The surface layer typically is grayish-brown loam about 2 inches thick. It is underlain by olive-brown, light yellowish-brown, and light-gray loam. Shale is at a depth of about 28 inches.

The main concerns of management are maintenance or improvement of rangeland vegetation and control of erosion.

The soils in this association are used mostly for range.

Soils on Intermixed Dissected Shale and Sandstone Hills

These soils are on intermixed dissected shale and sandstone hills. They formed in material weathered from sandstone and shale. Average annual precipitation is 12 to 18 inches, and the frost-free period is 90 to 125 days. The soils are used mostly for range, but in one association some of the soils are used for dry-farmed crops. The native vegetation is mainly mid and short grasses.

Five soil associations in the Big Horn County Area are on intermixed dissected shale and sandstone hills.

18. Abac-Peritsa association

Shallow and moderately deep, undulating to rolling and very steep, well-drained soils on sedimentary uplands

This association consists of undulating to rolling and very steep soils on sedimentary uplands.

This association makes up about 3 percent of the Area. It is about 35 percent Abac soils, 25 percent Peritsa soils, and 40 percent other soils. These other soils are in the Rottulee, Wayden, Twin Creek, and Fergus series.

Abac soils are rolling to very steep. The surface layer typically is reddish-brown silt loam about 3 inches thick. It is underlain by dark-red loam that is about 30 percent shale fragments. Shale is at a depth of about 19 inches.

Peritsa soils are undulating and rolling .The surface layer typically is reddish-brown silt loam about 3 inches thick. The subsoil is reddish-brown and red silty clay loam about 11 inches thick. It is underlain by light-red silty clay loam.

The main concerns of management are maintenance or improvement of rangeland vegetation and control of erosion.

The soils in this association are used mostly for range.

19. Absarokee-Maginnis association

Moderately deep and shallow, gently undulating to hilly and gently sloping to very steep, well-drained soils on sedimentary uplands

This association consists of gently undulating to hilly and gently sloping to very steep soils on sedimentary uplands.

This association makes up about 1 percent of the Area. It is about 40 percent Absarokee soils, 25 percent Maginnis soils, and 35 percent other soils and Shale outcrop. These other soils are in the Norbert, Eltsac, Castner, and Reeder series.

Absarokee soils are gently sloping to steep and gently undulating to hilly. The surface layer typically is grayish-brown silty clay loam about 6 inches thick. The subsoil is brown silty clay loam and clay about 18 inches thick. It is underlain by pale-yellow clay. Shale and sandstone are at a depth of 31 inches.

Maginnis soils are hilly and very steep. The surface layer typically is grayish-brown channery loam and silty clay loam about 6 inches thick. The subsoil is grayish-brown channery silty clay loam about 4 inches thick. It is underlain by very channery clay. Shale and sandstone are at a depth of about 16 inches.

The main concerns of management are localized protection from spring flooding of dryfarmed crops, maintenance or improvement of rangeland vegetation, and control of erosion.

The Absarokee soil in this association is suited to dryfarmed small grain where slopes are gently undulating to hilly. The Maginnis soil is suited to range.

20. Absarokee association

Moderately deep, gently undulating to hilly and gently sloping to steep, well-drained soils on sedimentary uplands

This association consists of gently undulating to hilly and gently sloping to steep soils on sedimentary uplands.

This association makes up about 1 percent of the Area. It is about 55 percent Absarokee soils, 20 percent Castner soils, and 25 percent other soils and Rock outcrop. These other soils are in the Reeder, Armington, Lennep, and Wayden series.

Absarokee soils are gently sloping to steep and gently undulating to hilly. The surface layer typically is grayish-brown silty clay loam about 6 inches thick. The subsoil is brown silty clay loam and clay about 18 inches thick. It is underlain by pale-yellow clay. Shale and sandstone are at a depth of 31 inches.

Castner soils are undulating to hilly and steep. The surface layer typically is dark grayish-brown sandy loam about 3 inches thick. The subsoil is dark-brown sandy loam about 7 inches thick. It is underlain by brown sandy loam. Sandstone and shale are at a depth of about 12 inches.

The main concerns of management are localized protection from spring flooding of dryfarmed crops, maintenance or improvement of rangeland vegetation, and control of erosion.

The Absarokee soil in this association is suited to dryfarmed small grain. The Castner soil is suited to range.

21. Wayden-Castner association

Shallow, undulating to hilly and strongly sloping to very steep, well-drained soils on sedimentary uplands

This association consists of undulating to hilly and strongly sloping to very steep soils on sedimentary uplands.

This association makes up about 3 percent of the Area. It is about 35 percent Wayden soils, 20 percent Castner soils, and 45 percent other soils and Rock outcrop. These other soils are in the Regent, Lap, and Rottulee series.

Wayden soils are strongly sloping to very steep and rolling to hilly. The surface layer typically is grayish-brown silty clay loam about 2 inches thick. The subsoil is grayish-brown silty clay loam about 5 inches thick. It is underlain by light brownish-gray silty clay loam. Shale is at a depth of about 19 inches.

Castner soils are undulating to hilly and steep. The surface layer typically is dark grayish-brown sandy loam about 3 inches thick. The subsoil is dark-brown sandy loam. Shale and sandstone are at a depth of about 12 inches.

The main concerns of management are maintenance or improvement of rangeland vegetation and control of erosion.

The soils in this association are suited to range.

22. Thedalund-Travessilla association

Moderately deep and shallow, undulating to rolling and very steep, well-drained soils on sedimentary uplands

This association consists of undulating to rolling and very steep soils on sedimentary uplands.

This association makes up about 2 percent of the Area. It is about 35 percent Thedalund soils, 20 percent Travessilla soils, 15 percent Rock outcrop, and 30 percent other soils. These other soils are in the Nelson, Cushman, Midway, McRae, Fort Collins, Colby, and Clapper series.

Thedalund soils are undulating to very steep. The surface layer typically is grayish-brown loam about 2 inches thick. It is underlain by olive-brown, light yellowish-brown, and light-gray loam. Shale is at a depth of about 28 inches.

Travessilla soils are undulating and rolling. The surface layer typically is grayish-brown sandy loam about 2 inches thick. It is underlain by channery sandy loam. Sandstone is at a depth of about 18 inches.

The main concerns of management are maintenance or improvement of rangeland vegetation and control of erosion.

The soils in this association are suited to range.

Soils on Mountains

These soils are on mountains. They formed in material weathered from shale, siltstone, limestone, and sandstone. Average annual precipitation ranges from 14 to 24 inches, and the frost-free period is 60 to 110 days. The soils are used mainly for range. The native vegetation is mainly mid and short grasses.

Two soil associations in the Big Horn County Area are on mountains.

23. Duncom-Tarrete-Mayflower association

Shallow and moderately deep, rolling to hilly and strongly sloping to very steep, well-drained soils on sedimentary highlands

This association consists of rolling to hilly and strongly sloping to very steep soils on sedimentary highlands.

This association makes up about 5 percent of the Area. It is about 25 percent Duncom soils, 20 percent Tarrete soils, 20 percent Mayflower soils, and 35 percent other soils. These other soils are in the Sawcreek, Ryorp, Adel, and Babb series.

Duncom soils are rolling to very steep. The surface layer typically is very dark grayish-brown gravelly loam about 4 inches thick. It is underlain by grayish-brown and pale-brown gravelly and very gravelly loam. Limestone is at a depth of about 18 inches.

Tarrete soils are strongly sloping to steep and rolling and hilly. The surface layer typically is dark reddish-brown loam about 4 inches thick. The subsoil is red silty clay and clay about 19 inches thick. It is underlain by light-red clay. Shale is at a depth of about 35 inches.

Mayflower soils are rolling and strongly sloping. The surface layer typically is dark grayish-brown silt loam about 11 inches thick. The subsoil is brown and reddish-brown silty clay and clay about 18 inches thick. It is underlain by light reddish-brown silty clay loam. Shale is at a depth of about 34 inches.

The main concerns of management are maintenance or improvement of rangeland vegetation and control of erosion.

The soils in this association are used for range.

24. Lap-Armington-Reeder association

Shallow to deep, undulating to hilly and strongly sloping to very steep, well-drained soils on sedimentary highlands

This association consists of undulating to hilly and strongly sloping to very steep soils on sedimentary highlands.

This association makes up about 4 percent of the Area. It is about 35 percent Lap soils, 20 percent Armington soils, 20 percent Reeder soils, and 25 percent other soils and Rock outcrop. These other soils are in the Castner, Vebar, Windham, and Darret series.

Lap soils are undulating to strongly sloping. The surface layer typically is dark grayish-brown channery loam about 4 inches thick. It is underlain by light brownish-gray and light-gray very channery and very stony loam. Limestone is at a depth of about 19 inches.

Armington soils are gently sloping to strongly sloping and rolling. The surface layer typically is reddish-brown silty clay about 4 inches thick. The subsoil is reddish-brown and weak-red clay about 29 inches thick.

Reeder soils are undulating to hilly. The surface layer is dark grayish-brown loam about 4 inches thick. The subsoil is brown loam and clay loam about 17 inches thick. It is underlain by pale-brown clay loam and loam. Sandstone and shale are at a depth of about 30 inches.

The main concerns of management are maintenance or improvement of rangeland vegetation and control of erosion.

The soils in this association are used for range.

Descriptions of the Soils

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

An important part of the description of each soil series is the soil profile, that is, the sequence of layers from the surface downward to rock or other underlying material. Each series contains two descriptions of this profile. The first is brief and in terms familiar to the layman. The second is much more detailed and is for those who need to make thorough and precise studies of soils. The profile described in the series is representative of mapping units in that series. If the profile of a given mapping unit is different from the one described for the series, these differences are stated in describing the mapping unit, or they are differences that are apparent in the name of the mapping unit. Color terms are for dry soil unless otherwise stated.

As mentioned in the section "How This Survey Was Made," not all mapping units are members of a soil series. Riverwash and Terrace escarpments, gravelly, for example, do not belong to a soil series; nevertheless, they are listed in alphabetic order along with the soil series.

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

The soils in the Big Horn County Area were mapped at either low intensity or medium intensity. Low-intensity mapping units were examined at moderate to wide intervals. A wide range of slope was permitted if it did not significantly affect use and management. Medium-intensity units were examined at closer intervals and were mapped in more detail and at a larger scale. Low-intensity units can be identified be-

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

Soil	Acres	Percent
Abac loam, rolling	1,648	0.1
Abac loam, hilly	33,756	1.1
Abac-Bitton complex, hilly	1,818	.1
Abac-Rock outcrop complex, very steep	21,020	.7
Absarokee silty clay loam, gently undulating	2,310	.1
Absarokee silty clay loam, undulating	5,026	.2
Absarokee silty clay loam, rolling	2,120	.1
Absarokee silty clay loam, hilly	1,790	.1
Absarokee-Castner complex, undulating	3,811	.1
Absarokee-Castner complex, hilly	608	(1)
Absarokee-Armington association, gently sloping	2,388	.1
Absher-Nobe clays	6,446	.2
Adel-Mayflower association, sloping	5,150	.2
Adger clay, 0 to 8 percent slopes	2,268	.1
Alice fine sandy loam, 4 to 15 percent slopes	2,219	.1
Allentine clay, 0 to 2 percent slopes	1,620	.1
Allentine clay, 2 to 4 percent slopes	921	(1)
Allentine-Bone complex, 0 to 1 percent slopes	2,300	.1
Allentine-Bone complex, 1 to 4 percent slopes	7,222	.2
Alluvial land, gravelly	1,684	.1
Alluvial land, cobbly	2,662	.1
Alluvial land, wet	1,822	.1
Amherst loam, undulating	2,249	.1
Amherst loam, rolling	2,120	.1
Amherst complex, rolling	510	(1)
Amherst complex, hilly	6,870	.2
Amherst-Maginnis complex, hilly	7,076	.2
Armington silty clay loam	256	(1)
Armington complex, rolling	1,194	(1)
Arnegard loam, 8 to 15 percent slopes	2,890	.1
Arnegard silt loam, 2 to 4 percent slopes	611	(1)
Arnegard silt loam, 4 to 8 percent slopes	625	(1)
Arvada silty clay loam	2,686	.1
Arvada-Bone clays	12,849	.4
Ascalon sandy loam, 4 to 8 percent slopes	1,187	(1)
Babb silt loam, rolling	5,423	.2
Babb silt loam, hilly	10,241	.3
Beauvais silty clay loam, gently undulating	9,355	.3
Beauvais silty clay loam, undulating	6,096	.2
Beauvais silty clay loam, rolling	1,263	(1)
Beauvais-Gilt Edge silty clay loams, gently undulating	775	(1)
Belfield silt loam, 0 to 1 percent slopes	1,333	(1)
Belfield silt loam, gently undulating	6,024	.2
Belfield silt loam, undulating	2,595	.1
Belfield-Adger complex, 0 to 1 percent slopes	269	(1)
Belfield-Adger complex, gently undulating	931	(1)
Belfield-Adger complex, undulating	2,175	.1
Benteen loam, rolling	3,744	.1
Benteen loam, hilly	6,192	.2
Bew silty clay loam, 0 to 1 percent slopes	1,100	(1)
Bew silty clay loam, gently undulating	1,028	(1)
Bitton gravelly loam, 2 to 8 percent slopes	624	(1)
Bitton soils, hilly	3,373	.1
Bone clay	596	(1)
Castner-Reeder loams, undulating	6,756	.2
Castner-Reeder loams, rolling	10,083	.3
Castner-Rock outcrop complex, rolling	4,523	.2
Castner-Vebar sandy loams, hilly	2,544	.1
Cherry silty clay loam, 2 to 8 percent slopes	2,602	.1
Chugter loam, 2 to 8 percent slopes	3,085	.1
Chugter complex, 2 to 15 percent slopes	1,977	.1
Clapper-Harvey complex, rolling	8,540	.3
Clapper-Midway complex, hilly	21,208	.7
Colby silt loam, 4 to 8 percent slopes	8,127	.3
Colby silt loam, 8 to 15 percent slopes	2,751	.1
Colby silty clay loam, 1 to 4 percent slopes	889	(1)
Colby silty clay loam, 4 to 8 percent slopes	6,984	.2
Colby silty clay loam, 8 to 15 percent slopes	3,217	.1
Colby-Beauvais silt loams, undulating	2,847	.1
Colby-Beauvais silt loams, rolling	1,202	(1)
Colby-Clapper silt loams, rolling	7,178	.2
Colby-Keiser silty clay loams, 4 to 8 percent slopes	6,264	.2
Colby-Midway complex, 8 to 15 percent slopes	10,910	.4
Colby association, rolling	3,984	.1
Colby association, hilly	6,732	.2
Cushman loam, undulating	2,746	.1
Danvers silty clay loam, 0 to 1 percent slopes	2,190	.1
Danvers silty clay loam, gently undulating	4,128	.1
Danvers silty clay loam, undulating	1,623	.1
Danvers cobbly silty clay loam, 1 to 4 percent slopes	2,657	.1
Danvers-Judith silty clay loams, gently undulating	3,042	.1
Danvers-Judith silty clay loams, undulating	5,348	.2
Danvers-Judith silty clay loams, hilly	4,002	.1
Dast sandy loam, rolling	2,062	.1
Dast sandy loam, hilly	934	(1)
Dast complex, hilly	6,809	.2
Dast complex, very steep	4,705	.2
Dast-Parshall sandy loams, rolling	7,561	.3
Doney loam, rolling	2,671	.1
Doney silty clay loam, hilly	2,040	.1
Doney-Reeder loams, rolling	23,935	.8
Doney-Ringling complex, rolling	2,809	.1
Doney-Ringling complex, hilly	19,686	.7
Doney-Ringling complex, very steep	23,132	.8
Doney-Rock outcrop complex, very steep	2,155	.1
Doney-Wayden complex, hilly	56,953	1.9
Duncom extremely channery loam, rolling	7,410	.2
Duncom complex, rolling	5,381	.2
Duncom-Tarrete association, rolling	50,437	1.7
Duncom-Tarrete association, hilly	147,305	4.8
Eltsac clay, undulating	1,080	(1)
Eltsac clay, rolling	26,612	.9
Eltsac cobbly clay, hilly	3,206	.1
Farnuf loam, 0 to 2 percent slopes	1,071	(1)
Farnuf loam, 2 to 4 percent slopes	816	(1)
Farnuf loam, 4 to 8 percent slopes	830	(1)
Farnuf-Doney association, sloping	23,318	.8
Fergus silt loam, 2 to 4 percent slopes	1,656	.1
Fergus silt loam, 4 to 8 percent slopes	2,382	.1
Fergus silt loam, 8 to 15 percent slopes	1,168	(1)
Fort Collins loam, 0 to 2 percent slopes	1,716	.1
Fort Collins loam, 2 to 4 percent slopes	3,553	.1
Fort Collins loam, 4 to 8 percent slopes	10,442	.3
Fort Collins loam, channeled, 4 to 8 percent slopes	3,102	.1
Frazer silty clay loam	2,375	.1
Frazer silty clay loam, saline	636	(1)
Frazer silty clay	264	(1)
Frazer and Korchea soils, channeled	3,820	.1
Gilt Edge silty clay loam, 0 to 2 percent slopes	3,798	.1
Gilt Edge silty clay loam, 2 to 4 percent slopes	3,412	.1
Gilt Edge-Bone complex, 0 to 1 percent slopes	1,435	.1
Gilt Edge-Bone complex, 1 to 4 percent slopes	2,684	.1
Glenberg fine sandy loam, 0 to 2 percent slopes	992	(1)
Glenberg fine sandy loam, 2 to 4 percent slopes	286	(1)

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

Soil	Acres	Percent
Glenberg fine sandy loam, 4 to 8 percent slopes	176	(1)
Glenberg loam, 0 to 2 percent slopes	918	(1)
Grail clay loam, 0 to 2 percent slopes	748	(1)
Grail clay loam, 2 to 8 percent slopes	2,196	.1
Grail clay loam, 8 to 15 percent slopes	572	(1)
Grail clay loam, 15 to 35 percent slopes	4,393	.1
Grail silty clay, 0 to 2 percent slopes	918	(1)
Hanson extremely stony loam, rolling	1,649	.1
Hanson-Babb association, very steep	48,326	1.6
Harvey loam, gently undulating	636	(1)
Harvey loam, undulating	3,213	.1
Harvey loam, rolling	2,940	.1
Harvey gravelly loam, undulating	1,351	(1)
Harvey complex, undulating	3,682	.1
Haverson loam, 0 to 2 percent slopes	5,442	.2
Haverson loam, 2 to 4 percent slopes	1,174	(1)
Haverson loam, saline	1,005	(1)
Haverson silty clay loam	2,611	.1
Haverson silty clay	494	(1)
Haverson silty clay, thick surface	1,290	(1)
Haverson-Hysham silty clay loams	7,933	.3
Haverson and Glenberg soils	4,115	.1
Haverson and Lohmiller soils, channeled	20,962	.7
Haverson and Lohmiller soils, frequently flooded	1,591	.1
Haverson and Lohmiller soils, wet	1,248	(1)
Haverson soils, saline	1,100	(1)
Heldt silty clay loam, 0 to 2 percent slopes	1,027	(1)
Heldt silty clay loam, 2 to 4 percent slopes	3,409	.1
Heldt silty clay loam, 4 to 8 percent slopes	13,140	.4
Heldt silty clay loam, 8 to 15 percent slopes	481	(1)
Heldt silty clay, 0 to 2 percent slopes	805	(1)
Heldt-Hysham silty clay loams, 0 to 2 percent slopes	2,750	.1
Heldt-Hysham silty clay loams, 2 to 4 percent slopes	3,589	.1
Hesper silty clay loam, 0 to 1 percent slopes	973	(1)
Hesper silty clay loam, 1 to 4 percent slopes	2,601	.1
Hesper silty clay loam, 4 to 8 percent slopes	6,647	.2
Hydro loam, 0 to 8 percent slopes	11,141	.4
Hydro silt loam, 0 to 2 percent slopes	1,338	(1)
Hydro silt loam, 2 to 4 percent slopes	2,396	.1
Hydro silt loam, 4 to 8 percent slopes	689	(1)
Hydro silty clay loam, 0 to 2 percent slopes	5,072	.2
Hydro silty clay loam, 2 to 4 percent slopes	1,661	.1
Hydro-Allentine complex, 1 to 4 percent slopes	7,571	.3
Hydro-Allentine complex, 4 to 8 percent slopes	10,910	.4
Hydro-Gilt Edge complex, 0 to 1 percent slopes	5,088	.2
Hysham loam, 0 to 2 percent slopes	1,758	.1
Hysham silty clay loam, 4 to 8 percent slopes	1,559	.1
Hysham silty clay loam, channeled, 0 to 4 percent slopes	1,387	.1
Hysham-Midway silty clay loams, 4 to 15 percent slopes	2,206	.1
Hysham and Lohmiller silty clay loams, 0 to 8 percent slopes	1,759	.1
Judith clay loam, 0 to 2 percent slopes	242	(1)
Judith clay loam, 2 to 4 percent slopes	759	(1)
Judith clay loam, 4 to 8 percent slopes	599	(1)
Judith-Windham complex, 4 to 8 percent slopes	2,969	.1
Judith-Windham complex, 8 to 15 percent slopes	26,105	.9
Keiser silty clay loam, 0 to 2 percent slopes	1,394	.1
Keiser silty clay loam, 2 to 4 percent slopes	10,845	.4
Keiser silty clay loam, 4 to 8 percent slopes	3,082	.1
Keiser-Colby complex, gently undulating	3,568	.1
Kim loam, 4 to 15 percent slopes	6,532	.2
Korchea loam, 0 to 2 percent slopes	1,369	(1)
Korchea loam, 2 to 4 percent slopes	694	(1)
Korchea silt loam, 0 to 2 percent slopes	697	(1)
Korchea silt loam, frequently flooded	2,974	.1
Korchea silty clay loam, 0 to 2 percent slopes	1,610	.1
Korchea silty clay loam, 2 to 4 percent slopes	239	(1)
Korchea and Frazer soils, water table	16,467	.5
Kyle silty clay, 0 to 2 percent slopes	6,030	.2
Kyle silty clay, 2 to 4 percent slopes	3,115	.1
Kyle silty clay, 4 to 8 percent slopes	4,342	.1
Kyle gravelly silty clay, 8 to 15 percent slopes	5,212	.2
Kyle clay, saline	2,345	.1
La Fonda loam, 2 to 4 percent slopes	782	(1)
Lap-Trulon complex, rolling	2,782	.1
Lap association, undulating	3,757	.1
Lap association, rolling	4,459	.2
Lap-Armington association, rolling	75,613	2.4
Lavina-Travessilla loams, undulating	3,613	.1
Lennep loam, 2 to 4 percent slopes	6,817	.2
Lennep loam, 4 to 8 percent slopes	4,474	.2
Lennep-Adger complex, gently undulating	2,480	.1
Lennep-Adger complex, undulating	1,897	.1
Lismas clay, undulating	875	(1)
Lismas gravelly clay, rolling	13,010	.4
Lismas gravelly clay, hilly	36,538	1.2
Lismas-Shale outcrop complex, rolling	38,056	1.3
Lismas-Shale outcrop complex, steep	49,378	1.6
Lismas-Vananda clays, undulating	17,899	.6
Lohmiller silty clay loam, 0 to 2 percent slopes	2,243	.1
Lohmiller silty clay loam, 2 to 4 percent slopes	619	(1)
Lohmiller silty clay loam, 4 to 8 percent slopes	1,668	.1
Lohmiller silty clay loam, 8 to 15 percent slopes	1,549	.1
Lohmiller silty clay, saline, 0 to 2 percent slopes	1,184	(1)
Lohmiller silty clay, saline, 2 to 4 percent slopes	103	(1)
Lohmiller-Midway silty clay loams, undulating	1,946	.1
Macar loam, 4 to 8 percent slopes	1,172	(1)
Maginnis-Shale outcrop complex, very steep	1,910	.1
Maginnis-Windham complex, hilly	2,110	.1
Marias clay, 0 to 2 percent slopes	582	(1)
Marias clay, 2 to 4 percent slopes	531	(1)
Marias clay, 4 to 8 percent slopes	1,653	.1
Marias clay, 8 to 15 percent slopes	1,040	(1)
Maschetah complex, rolling	2,219	.1
Maschetah-Norbert complex, hilly	19,716	.6
Mayflower silt loam, rolling	1,952	.1
Mayflower association, rolling	7,127	.2
McKenzie clay	538	(1)
McRae loam, 0 to 1 percent slopes	1,649	.1
McRae loam, 1 to 4 percent slopes	5,488	.2
McRae loam, 4 to 8 percent slopes	23,264	.8
McRae silty clay loam, 0 to 1 percent slopes	685	(1)
Midway silty clay loam, undulating	10,897	.4
Midway silty clay loam, rolling	33,557	1.1
Midway silty clay loam, hilly	47,008	1.5
Midway-Lismas complex, rolling	13,091	.4
Midway-Lismas complex, hilly	14,077	.5
Midway-Thedalund complex, rolling	37,270	1.2

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

Soil	Acres	Percent
Midway-Thedalund complex, hilly	139,138	4.5
Midway-Thurlow association, rolling	276	(1)
Morton silt loam, undulating	2,635	.1
Nelson fine sandy loam, undulating	19,889	.7
Nelson-Alice fine sandy loams, rolling	6,937	.2
Nelson-Glenberg sandy loams, undulating	14,716	.5
Neville loam, rolling	2,635	.1
Norbert-Eltsac clays, hilly	44,225	1.5
Norbert-Shale outcrop complex, steep	34,526	1.1
Nunn silty clay loam, 0 to 1 percent slopes	744	(1)
Nunn silty clay loam, 1 to 4 percent slopes	4,015	.1
Nunn silty clay loam, 4 to 8 percent slopes	6,266	.2
Nunn silty clay loam, 8 to 15 percent slopes	6,847	.2
Nunn-Midway silty clay loams, 4 to 15 percent slopes	7,312	.2
Olney fine sandy loam, 4 to 12 percent slopes	1,760	.1
Parshall fine sandy loam, 4 to 8 percent slopes	1,195	(1)
Peritsa silt loam, undulating	7,757	.3
Peritsa-Abac loams, rolling	12,844	.4
Peritsa complex, rolling	2,480	.1
Pierre clay, undulating	13,446	.4
Pierre clay, rolling	13,670	.5
Pierre-Kyle clays, gently undulating	4,589	.1
Pierre-Lismas clays, rolling	30,512	1.0
Pierre-Lismas clays, hilly	62,766	2.1
Pultney-Neville association, undulating	7,660	.3
Quietus loam	3,500	.1
Raynesford loam, undulating	6,455	.2
Reeder loam, gently undulating	1,143	(1)
Reeder loam, undulating	3,846	.1
Reeder loam, hilly	2,960	.1
Reeder-Regent complex, rolling	3,058	.1
Reeder-Rentsac complex, undulating	4,954	.2
Reeder-Darret association, undulating	3,536	.1
Reeder-Darret association, rolling	2,573	.1
Regent silty clay loam, gently undulating	568	(1)
Regent silty clay loam, undulating	2,344	.1
Regent silty clay loam, rolling	4,907	.2
Renohill silty clay loam, undulating	5,243	.2
Rentsac-Doney complex, rolling	1,116	(1)
Richfield silty clay loam, 0 to 2 percent slopes	1,506	.1
Richfield silty clay loam, gently undulating	1,889	.1
Richfield silty clay loam, undulating	2,254	.1
Richfield-Beauvais silty clay loams, gently undulating	706	(1)
Richfield-Beauvais silty clay loams, undulating	3,949	.1
Riverwash	1,345	(1)
Rock outcrop-Duncom complex, very steep	118	(1)
Rock outcrop-Lap complex, very steep	13,974	.5
Rock outcrop-Pultney complex, very steep	1,638	.1
Rock outcrop-Rentsac complex, rolling	1,614	.1
Rock outcrop-Windham complex, very steep	9,664	.3
Rottulee silt loam, gently undulating	2,178	.1
Rottulee silt loam, undulating	3,527	.1
Rottulee silt loam, rolling	3,853	.1
Rottulee-Abac complex, rolling	3,676	.1
Ryorp sandy loam, undulating	8,932	.3
Saline land	5,493	.2
Savage silty clay loam, 0 to 2 percent slopes	3,172	.1
Savage silty clay loam, 2 to 4 percent slopes	2,547	.1
Savage silty clay loam, 4 to 8 percent slopes	3,721	.1
Savage silty clay loam, undulating	3,707	.1
Savage silty clay loam, rolling	1,383	.1
Savage-Wayden silty clay loams, 4 to 15 percent slopes	2,659	.1
Savage and Frazer soils, 0 to 4 percent slopes	3,208	.1
Searing loam, undulating	1,566	.1
Searing loam, hilly	7,456	.3
Searing-Ringling complex, rolling	1,980	.1
Shaak clay loam, 4 to 8 percent slopes	3,648	.1
Shaak silty clay loam, 0 to 2 percent slopes	2,626	.1
Shaak silty clay loam, gently undulating	3,325	.1
Shaak silty clay loam, undulating	4,376	.1
Shaak silty clay loam, rolling	4,799	.2
Shaak complex, 4 to 15 percent slopes	13,523	.4
Shale outcrop	5,272	.2
Shale outcrop-Midway complex, steep	14,144	.5
Shale outcrop-Norbert complex, hilly	4,052	.1
Shonkin clay loam	2,013	.1
Sofia silty clay, 0 to 2 percent slopes	2,515	.1
Sofia silty clay, gently undulating	6,391	.2
Spearfish-Clapper complex, hilly	6,856	.2
Spearfish-Rock outcrop complex, very steep	9,714	.3
Spearfish-Pultney association, rolling	6,150	.2
Spearfish-Pultney association, hilly	17,858	.6
Spearman loam, undulating	2,724	.1
Spearman-Wibaux complex, rolling	11,578	.4
Splitro-Sawcreek sandy loams, rolling	626	(1)
Splitro-Sawcreek sandy loams, hilly	5,156	.2
Stormitt extremely stony loam, hilly	6,860	.2
Stormitt complex, 0 to 4 percent slopes	1,952	.1
Stormitt complex, 4 to 15 percent slopes	379	(1)
Talag clay, 0 to 8 percent slopes	4,221	.1
Talag-Allentine complex, 0 to 4 percent slopes	3,230	.1
Tarrete silty clay loam, 8 to 15 percent slopes	2,648	.1
Terrace escarpments, gravelly	11,996	.4
Terrace escarpments, loamy	10,110	.3
Terry fine sandy loam, undulating	2,370	.1
Terry-Travessilla sandy loams, undulating	516	(1)
Teton loam, 8 to 25 percent slopes	3,486	.1
Teton complex, 25 to 45 percent slopes	3,262	.1
Thedalund loam, undulating	6,431	.2
Thedalund-Clapper complex, hilly	30,332	1.0
Thedalund-Cushman loams, undulating	5,028	.2
Thedalund-Fort Collins complex, rolling	46,303	1.5
Thedalund-McRae loams, dissected	16,837	.5
Thedalund-Midway complex, rolling	25,897	.8
Thedalund-Nelson complex, rolling	8,272	.3
Thedalund-Rock outcrop complex, hilly	56,248	1.8
Thedalund-Rock outcrop complex, very steep	5,096	.2
Thedalund-Travessilla loams, rolling	5,095	.2
Thedalund-Wibaux loams, undulating	2,502	.1
Thedalund-Wibaux complex, rolling	14,913	.5
Thedalund-Wibaux stony loams, hilly	51,596	1.7
Thedalund-Wibaux complex, very steep	12,257	.4
Thurlow silty clay loam, 0 to 1 percent slopes	1,291	(1)
Thurlow silty clay loam, 1 to 4 percent slopes	5,094	.2
Thurlow silty clay loam, 4 to 8 percent slopes	8,315	.3
Thurlow-Midway silty clay loams, 4 to 15 percent slopes	51,842	1.7
Toluca-Harvey complex, undulating	9,714	.3
Travessilla-Rock outcrop complex, rolling	1,676	.1
Travessilla-Thedalund loams, rolling	9,881	.3
Tullock loamy fine sand, rolling	1,841	.1
Twin Creek loam, 2 to 4 percent slopes	1,336	(1)
Twin Creek loam, 4 to 8 percent slopes	2,572	.1
Twin Creek loam, 8 to 15 percent slopes	859	(1)
Twin Creek-Korchea complex, 2 to 8 percent slopes	1,701	.1
Vananda clay, 0 to 1 percent slopes	3,327	.1
Vananda clay, 1 to 8 percent slopes	26,015	.8
Vebar fine sandy loam, undulating	498	(1)
Vebar fine sandy loam, rolling	1,024	(1)
Vebar-Castner complex, undulating	1,182	(1)
Vebar-Castner complex, rolling	1,969	.1

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

Soil	Acres	Percent	Soil	Acres	Percent
Vebar complex, rolling	288	(1)	Windham complex, 15 to 35 percent slopes	4,897	.2
Wages loam, 0 to 2 percent slopes	552	(1)	Windham-Arnegard complex, 15 to 35 percent slopes	5,566	.2
Wages loam, 2 to 4 percent slopes	3,249	.1	Windham-Norbert complex, 15 to 50 percent slopes	6,948	.2
Wages loam, 4 to 8 percent slopes	5,671	.2	Windham-Wayden complex, 15 to 35 percent slopes	5,244	.2
Wayden silty clay loam, rolling	11,456	.4	Windham-Lap association, very steep	20,762	.7
Wayden silty clay loam, hilly	13,452	.4	Winnett complex, undulating	1,507	.1
Wayden-Arnegard complex, hilly	5,346	.2	Xavier silty clay loam, gently undulating	1,256	(1)
Wayden-Grail complex, hilly	7,178	.2	Xavier silty clay loam, undulating	2,381	.1
Wayden-Judith silty clay loams, hilly	4,499	.1	Xavier silty clay loam, rolling	672	(1)
Wayden-Regent silty clay loams, hilly	29,305	.9	Xavier-Shaak complex, undulating	693	(1)
Wayden-Savage silty clay loams, rolling	13,669	.4	Xavier-Shaak complex, rolling	1,116	(1)
Wayden-Rock outcrop complex, rolling	3,220	.1	Gravel pits	236	(1)
Wayden-Rock outcrop complex, hilly	12,185	.4	Water	105	(1)
Wayden-Shale outcrop complex, very steep	3,848	.1			
Wayden complex, hilly	8,534	.3			
Wibaux loam, hilly	12,169	.4			
Wibaux-Spearman complex, rolling	21,101	.7			
Windham cobbly loam, 15 to 35 percent slopes	6,658	.2	Total	3,042,595	100.0

[1] Less than 0.05 percent.

cause the second letter of the map symbol is capitalized; the second letter of medium-intensity units is not capitalized.

The acreage and proportionate extent of each mapping unit are shown in table 1. Many of the terms used in describing soils can be found in the Glossary, and more detailed information about the terminology and methods of soil mapping can be obtained from the Soil Survey Manual (*10*).[1]

Abac Series

The Abac series consists of shallow, rolling to very steep, well-drained soils on red shale and sandstone uplands. Slopes range from 8 to 50 percent. These soils formed in material weathered from the underlying fine-grained sandstone and silty shale. Elevation ranges from 4,000 to 6,000 feet.

The native vegetation is mainly bluebunch wheatgrass, prairie junegrass, green needlegrass, western wheatgrass, Hoods phlox, and fringed sagewort. Where snow accumulates, vegetation includes wild plum, snowberry, thornapple, and roses. Annual precipitation is 15 to 17 inches, the average annual soil temperature is 44° to 47° F, and the frost-free period is 90 to 105 days.

In a representative profile the surface layer is reddish-brown silt loam about 3 inches thick. The underlying material is red loam and gravelly loam and light reddish-brown very gravelly loam. It averages about 30 percent semihard shale fragments. Red platy shale and sandstone begin at a depth of about 19 inches.

Permeability is moderate, and available water capacity is very low. The effective rooting depth is about 20 inches. Most of these soils are used for range, recreation, watershed, and wildlife. In places they are used for crops.

Representative profile of Abac loam, rolling, in grassland, approximately 1,950 feet east and 200 feet north of the SW. corner sec. 29, T. 5 S., R. 30 E.

A1—0 to 3 inches, reddish-brown (2.5YR 5/4) silt loam, dark reddish brown (2.5YR 3/4) moist; moderate, thin, platy structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; moderately effervescent; few soft, red shale fragments; clear, smooth boundary.

C1—3 to 8 inches, red (2.5YR 5/6) loam, dark-red (2.5YR 3/6) moist; weak, medium, prismatic structure; hard, friable, sticky and plastic; common very fine roots; many fine tubular pores; 15 percent (volume) soft shale fragments; moderately effervescent; clear, wavy boundary.

C2—8 to 15 inches, red (2.5YR 5/6) gravelly loam, dark red (2.5YR 3/6) moist; fine, blocky structure; hard, friable, slightly sticky and slightly plastic; common very fine roots and pores; 30 percent (volume) soft shale fragments; moderately effervescent; common fine lime threads; clear, wavy boundary.

C3—15 to 19 inches, light reddish-brown (2.5YR 6/4) very gravelly loam, red (2.5YR 4/6) moist; massive; hard, friable, slightly sticky and slightly plastic; a few mats of very fine roots follow the bedding planes of the shale; 60 percent (volume) soft shale fragments; strongly effervescent; few fine lime threads; abrupt, irregular boundary.

C4—19 to 26 inches, red platy shale and fine-grained sandstone; calcareous.

Depth to shale or soft sandstone ranges from 6 to 20 inches. Coarse fragments of shale, sandstone, and, in places, limestone make up 15 to 35 percent, by volume, of the soil. The soil material is generally loam or very fine sandy loam and, in places, silt loam. The A1 horizon ranges from reddish brown to weak red when dry. The C horizon ranges from light reddish brown to weak red and red.

Abac loam, rolling (Aa).—This soil is on dissected shale uplands that are made up of multiple ridges and hills. Slopes are 8 to 15 percent. Generally, this soil is in a band below hilly Abac soils. It has the profile described as representative of the series.

Included with this soil in mapping are small areas of Peritsa, Twin Creek, and Fergus soils that make up 15 to 25 percent of the area of this mapping unit.

Runoff is medium, and the hazard of erosion is severe. This soil is used mostly for range, wildlife, recreation, and watershed. Small areas of this soil in-

[1] Italic numbers in parentheses refer to Literature Cited, p. 222.

cluded with deep soils are used for dryfarmed crops. Capability unit VIe–1 dryland; Silty range site, 15- to 19-inch precipitation zone; windbreak suitability group 3M.

Abac loam, hilly (AB).—This soil is on deeply dissected shale uplands that are made up of high, isolated hills and ridges. Slopes are mostly 15 to 35 percent, but in places they are as much as 40 percent. The soil has a profile similar to the one described as representative of the series, but it is steeper.

Included with this soil in mapping are areas of Fergus and Peritsa soils that are covered with snowberry, chokecherry, and wild plum. Shale and sandstone outcrops are on south-facing and east-facing slopes of steep hills and valley rims in places. These included soils and outcrops make up 10 to 20 percent of the area of this mapping unit.

Runoff is rapid, and the hazard of erosion is severe. This soil is used for range, watershed, recreation, and wildlife. Capability unit VIe–1 dryland; Thin Hilly range site, 15- to 19-inch precipitation zone; windbreak suitability group 4.

Abac-Bitton complex, hilly (AC).—This complex is made up of steep and hilly soils on deeply dissected gravelly benches and terraces underlain by sedimentary shale bedrock. It is about 70 percent Abac soil and 30 percent Bitton soil. The Abac soil is on the lower two-thirds of valley sides where slopes are 20 to 35 percent. The Bitton soil is in bands, 75 to 150 feet wide, that extend from the rim downward on valley sides where slopes are 15 to 20 percent. The Abac soil in this complex has a profile similar to the one described as representative of the Abac series, but it has a few limestone, quartzite, and gneiss fragments of pebble size on the surface. The Bitton soil has a profile similar to the one described as representative of the Bitton series, but it has limestone gravel, more flour lime, and predominantly pink and reddish-brown underlying material. Included in mapping are small bands of Peritsa soils.

Runoff is medium, and the hazard of erosion is severe. These soils are used for range, watershed, recreation, and wildlife. The Bitton soil is a source of road gravel in places. Capability unit VIe–1 dryland; Thin Hilly range site, 15- to 19-inch precipitation zone; windbreak suitability group 4.

Abac-Rock outcrop complex, very steep (AD).—This complex is made up of very steep soils on sedimentary uplands. It is 60 to 85 percent Abac loam and 15 to 40 percent Rock outcrop. Areas of this complex consist of several rock ledges, 5 to 30 feet thick, in a stairstep pattern on the sides of deep valleys or high hills. The Abac soil is on hilltops and steep sides of hills and valleys between areas of Rock outcrop. It has slopes of mostly 35 to 50 percent. Rock outcrop has slopes that range from 50 to 95 percent. The Abac soil in this complex has a profile similar to the one described as representative of the Abac series, but it is steeper.

Runoff is rapid, and the hazard of erosion is severe. These soils are used for range, watershed, recreation, and wildlife. Capability unit VIIe–1 dryland; Thin Breaks range site, 15- to 19-inch precipitation zone; windbreak suitability group 4.

Absarokee Series

The Absarokee series consists of moderately deep, gently sloping to steep and gently undulating to hilly, well-drained soils on sedimentary uplands. Slopes are mostly 2 to 35 percent, but they range to 1 percent. These soils formed in material weathered from the underlying hard, mixed sandstone and shale. Elevation ranges from 3,800 to 4,400 feet.

The native vegetation is mainly western wheatgrass, green needlegrass, Idaho fescue, broom snakeweed, fringed sagewort, and Japanese brome. Annual precipitation is 14 to 16 inches, the average annual soil temperature is 44° to 46° F, and the frost-free period is 100 to 115 days.

In a representative profile the surface layer is grayish-brown and dark grayish-brown silt loam and silty clay loam about 6 inches thick. The subsoil is silty clay loam, silty clay, and clay about 18 inches thick. It is dark grayish brown and brown in the upper part and pale brown and light yellowish brown in the lower part. The substratum is pale-yellow clay. Shale and sandstone are at a depth of 31 inches.

Permeability is moderately slow, and available water capacity is low. The effective rooting depth is about 36 inches. These soils are used for dryfarmed crops, wildlife, watershed, recreation, and range.

Representative profile of Absarokee silty clay loam, undulating, in grassland, approximately 1,800 feet south and 400 feet west of the NE. corner sec. 17, T. 4 S., R. 28 E.

A11—0 to 2 inches, grayish-brown (10YR 5/2) heavy silt loam, very dark brown (10YR 2/2) moist; moderate, thin, platy structure; hard, friable, slightly sticky and slightly plastic; many fine and very fine roots; clear, smooth boundary.

A12—2 to 6 inches, dark grayish-brown (10YR 4/2) light silty clay loam, very dark grayish brown (10YR 3/2) moist; moderate, medium, prismatic structure parting to weak, medium, blocky; hard, friable, sticky and plastic; many very fine and micro roots; common very fine pores; gradual, wavy boundary.

B1—6 to 10 inches, dark grayish-brown (10YR 4/2) silty clay loam, dark brown (10YR 3/3) moist; strong, medium, prismatic structure parting to moderate, medium, blocky; very hard, firm, very sticky and very plastic; many very fine roots; many very fine pores; clear, wavy boundary.

B21t—10 to 17 inches, brown (10YR 5/3) clay, dark brown (10YR 4/3) moist; strong, medium, prismatic structure parting to strong, medium, blocky; very hard, very firm, very sticky and very plastic; common very fine roots; common very fine pores; moderately thick, patchy clay films on peds; clear, wavy boundary.

B22t—17 to 20 inches, pale-brown (10YR 6/3) light silty clay, dark yellowish brown (10YR 4/4) moist; moderate, medium, prismatic structure parting to moderate, medium and fine, blocky; very hard, firm, very sticky and very plastic; common very fine roots; many very fine pores; moderately thick, patchy clay films on peds; clear, wavy boundary.

B3ca—20 to 24 inches, light yellowish-brown (2.5Y 6/4) silty clay loam, light olive brown (2.5Y 5/4) moist; weak, medium, prismatic structure parting to moderate, medium, blocky; hard, friable, sticky and plastic; strongly effervescent; few very fine roots; many very fine pores; common fine and medium, soft masses of lime; clear, wavy boundary.

Cca—24 to 31 inches, pale-yellow (2.5Y 7/4) clay, light yellowish brown (2.5Y 6/4) moist; moderate,

coarse, blocky structure; very hard, firm, very sticky and very plastic; few very fine roots; strongly effervescent; clear, wavy boundary.
R—31 to 33 inches, hard platy sandstone and shale.

Depth to bedrock ranges from 20 to 40 inches, and depth to calcareous material, from 12 to 24 inches. The A horizon ranges from grayish-brown to dark grayish-brown loam to silty clay loam. The B2t horizon is clay or silty clay that ranges from brown to dark yellowish brown when dry. The Cca horizon is light yellowish brown to pale yellow.

Absarokee silty clay loam, gently undulating (Ae).—This soil is on smooth, high sedimentary uplands. Slopes are mostly 2 to 4 percent, but they range to 1 percent. The soil has a profile similar to the one described as representative of the series, but it is less sloping. Included in mapping are spots of Rock outcrop and Amherst channery clay loam.

Runoff is slow, and the hazard of erosion is slight. This soil is used for dryfarmed crops, hay, wildlife, recreation, and range. Capability unit IIe–2 dryland; Clayey range site, 15- to 19-inch precipitation zone; windbreak suitability group 2M.

Absarokee silty clay loam, undulating (Af).—This soil is on shale uplands at the heads and along the edges of deep drainageways. Slopes are mostly 4 to 6 percent, and they are 200 to 300 feet long. The soil has the profile described as representative of the series. Included in mapping are small spots of Lennep loam and Maginnis channery loam.

Runoff is medium, and the hazard of erosion is moderate. This soil is used for dryfarmed crops, hay, wildlife, recreation, watershed, and range. Capability unit IIIe–2 dryland; Clayey range site, 15- to 19-inch precipitation zone; windbreak suitability group 2M.

Absarokee silty clay loam, rolling (Ag).—This soil is on dissected sedimentary uplands. The landscape consists of rounded, narrow ridges between deep, narrow drainageways. Slopes are mostly 8 to 10 percent, but they range to 15 percent. Slopes range from 75 to 200 feet long. The soil has a profile similar to the one described as representative of the series, but it is steeper.

Included with this soil in mapping are small spots of Amherst channery loam, a few areas of soils that have bedrock at a depth of less than 20 inches, areas of Absarokee soils that have coarse fragments throughout, and areas of soils that have a surface covered with coarse sandstone fragments.

Runoff is medium, and the hazard of erosion is moderate. This soil is used for watershed, recreation, wildlife, range, hay, and dryfarmed crops. Capability unit IVe–2 dryland; Clayey range site, 15- to 19-inch precipitation zone; windbreak suitability group 2M.

Absarokee silty clay loam, hilly (AH).—This soil is on ridges and hills in the sedimentary uplands. Slopes are mostly 20 to 30 percent, but they range from 15 to 35 percent. Slopes range from 200 to 400 feet long. In places they are broken by a low rock ledge that leaves scattered boulders of conglomerate and hard sandstone on the surface. The soil has a profile similar to the one described as representative of the series, but it is steeper and is underlain by semihard shale.

Included with this soil in mapping are small areas of Reeder, Castner, and Regent soils that make up 10 to 25 percent of the area of this mapping unit. The Reeder and Regent soils are on smooth hilltops or at the lower end of long foot slopes. The Castner soil is around rock ledges and valley rims.

Runoff is rapid, and the hazard of erosion is severe. This soil is used for range, wildlife, recreation, and watershed. Capability unit VIe–1 dryland; Thin Hilly range site, 15- to 19-inch precipitation zone; windbreak suitability group 4.

Absarokee-Castner complex, undulating (Ak).—This complex is made up of undulating soils on sedimentary uplands. It is 50 to 70 percent Absarokee loam, 20 to 35 percent Castner loam, and 5 to 15 percent Rock outcrop. The Castner soil is typically in a band around the Rock outcrop. Slopes are mostly 4 to 8 percent, but they range to 2 percent. In places spots as large as 5 acres are entirely free of Rock outcrop. The Absarokee soil in this complex has a profile similar to the one described as representative of the Absarokee series, but the surface layer is loam.

Runoff is medium, and the hazard of erosion is slight. These soils are used for range, wildlife, recreation, and watershed. Capability unit VIs–1 dryland; Shallow range site, 15- to 19-inch precipitation zone; windbreak suitability group 4.

Absarokee-Castner complex, hilly (AL).—This complex is made up of hilly soils in the sedimentary uplands. It is 55 to 70 percent Absarokee loam and 25 to 40 percent Castner loam. Slopes are mostly 15 to 35 percent, but they range to 8 percent. The Absarokee soil is on smooth tops and sides of hills. The Castner soil is around the areas of Rock outcrop included in this unit. The Absarokee soil in this complex has a profile similar to the one described as representative of the Absarokee series, but it is steeper and has a surface layer of loam. Included in mapping are some areas of Wayden and Armington soils.

Runoff is rapid, and the hazard of erosion is moderate to severe. These soils are used for range, wildlife, recreation, and watershed. Capability unit VIe–1 dryland; Thin Hilly range site, 15- to 19-inch precipitation zone; windbreak suitability group 4.

Absarokee-Armington association, gently sloping (AM).—This association is made up of gently sloping soils on sedimentary uplands. Slopes are mostly 4 to 8 percent, but they range to 2 percent. The association is about 55 percent Absarokee silty clay loam and 35 percent Armington silty clay loam. The soils are in shallow valleys below rock ledges. The two major soils are intermixed, but the red and pink Armington soil is easy to identify. The Armington soil in this complex has a profile similar to the one described as representative of the Armington series, but it has many medium and coarse, soft masses of segregated lime in the substratum.

Included with these soils in mapping are areas of Reeder and Regent soils on the steeper knolls and spur ridges. Also included are areas of Rock outcrop. These inclusions make up about 10 percent of this unit.

Runoff is medium, and the hazard of erosion is moderate. These soils are used for dryfarmed crops, hay, wildlife, recreation, watershed, and range. Capability unit IIIe–2 dryland; Clayey range site, 15- to 19-inch precipitation zone; windbreak suitability group 2M.

Absher Series

The Absher series consists of deep, nearly level and gently sloping, well-drained, alkali-affected soils on terraces, fans, and sedimentary uplands. Slopes range from 1 to 4 percent. These soils formed in mixed clay and clay loam alluvium. Elevation ranges from 3,600 to 4,200 feet.

The native vegetation is western wheatgrass, prairie junegrass, cheatgrass, and Sandberg bluegrass. Annual precipitation is 14 to 16 inches, the average annual soil temperature is 45° to 47° F, and the frost-free period is about 110 days.

In a representative profile the surface layer is light brownish-gray loam and clay about 5 inches thick. The subsoil is light brownish-gray and light olive-gray clay about 17 inches thick. The substratum is olive and olive-gray clay loam and sandy clay loam that extends to a depth of 62 inches or more.

Permeability is very slow in the subsoil, and available water capacity is moderate or high. The effective rooting depth is 60 inches or more. These soils are used for range, wildlife, recreation, and watershed.

Representative profile of Absher clay in an area of Absher-Nobe clays, in grassland, 1,320 feet south and 750 feet east of the NW. corner sec. 15, T. 8 S., R. 33 E.

A21—0 to 3 inches, light brownish-gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; weak, thin, platy structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; clear, smooth boundary.

A22—3 to 5 inches, light brownish-gray (2.5Y 6/2) clay, dark grayish brown (2.5Y 4/2) moist; moderate, thin, platy structure; hard, friable, slightly sticky and plastic; many very fine roots and pores; abrupt, smooth boundary.

B21t—5 to 10 inches, light brownish-gray (2.5Y 6/2) clay, dark grayish brown (2.5Y 4/2) moist; strong, medium, prismatic structure; extremely hard, very firm, very sticky and very plastic; common very fine roots; very fine pores; moderately thick, patchy clay films on peds; light-gray, clean sand grains coating upper 2 inches of prisms; abrupt, smooth boundary.

B22t—10 to 14 inches, light brownish-gray (2.5Y 6/2) clay, dark grayish brown (2.5Y 4/2) moist; moderate, medium, prismatic structure parting to strong, fine and medium, blocky; extremely hard, very firm, very sticky and very plastic; many very fine roots; moderately thick, continuous clay films on peds; clear, wavy boundary.

B3cacs—14 to 22 inches, light olive-gray (5Y 6/2) light clay, olive (5Y 4/3) moist; weak, medium, prismatic structure parting to moderate, medium, blocky; very hard, firm, very sticky and very plastic; common very fine roots; slightly effervescent; common fine, soft lime masses; few fine gypsum crystals; gradual, wavy boundary.

C1cacs—22 to 29 inches, olive (5Y 5/3) clay loam, olive (5Y 4/3) moist; moderate, coarse, blocky structure; very hard, friable, sticky and plastic; few fine roots; slightly effervescent; many fine and medium, soft lime masses; few fine gypsum crystals; gradual, wavy boundary.

C2—29 to 39 inches, olive-gray (5Y 5/2) heavy clay loam, olive (5Y 4/3) moist; massive; very hard, firm, very sticky and plastic; slightly effervescent; common fine, soft lime masses; clear, wavy boundary.

C3—39 to 62 inches, olive-gray (5Y 5/2) sandy clay loam, olive (5Y 4/3) moist; massive; hard, firm, sticky and plastic; slightly effervescent.

Depth to segregated lime ranges from 12 to 36 inches, and depth to gypsum, from 12 to 20 inches. The B2t horizon ranges from olive to light yellowish brown when dry. It is 40 to 55 percent clay. The C3 horizon below a depth of about 40 inches in places has thin layers of loam, sandy loam, and silt.

Absher-Nobe clays (An).—This complex is made up of nearly level and gently sloping soils on terraces and fans in the sedimentary uplands. It is 60 to 75 percent Absher clay and 20 to 30 percent Nobe clay. Slopes are 1 to 4 percent. Areas range from 10 to 60 acres in size. The Nobe soil is in 5- to 8-inch microdepressions.

Included with these soils in mapping in the areas of Absher soil are small areas of a soil that is underlain by shale bedrock at a depth of 40 to 60 inches. Also included are small spots of Lennep loam and Marias clay.

Runoff is medium, and the hazard of erosion is slight. These soils are used for range, wildlife, and recreation. Capability unit VIs–1 dryland; Pan Spots range site, 15- to 19-inch precipitation zone; windbreak suitability group 3S.

Adel Series

The Adel series consists of deep, sloping, well-drained soils on foot slopes on the upper sides of mountain valleys. Slopes are mostly 4 to 8 percent, but they range to 15 percent. These soils formed in loamy alluvium derived from mixed sandstone and shale. Elevation ranges from 4,000 to 6,000 feet.

The native vegetation is mainly mountain bromegrass, rough fescue, wild geranium, horsemint, snowberry, big sagebrush, and wild rose. Annual precipitation is 18 to 22 inches, the average annual soil temperature is 39° to 44° F, and the frost-free period is 60 to 70 days.

In a representative profile the surface layer is dark grayish-brown loam about 8 inches thick. The subsoil is dark grayish-brown and pale-brown loam and clay loam about 32 inches thick. Red clay shale is at a depth of about 40 inches.

Permeability is moderate, and available water capacity is moderate or high. The effective rooting depth is 40 inches or more. These soils are used for range, watershed, recreation, and summer game range.

Representative profile of Adel loam in an area of Adel-Mayflower association, sloping, in grassland, 2,640 feet north and 1,320 feet west of the SE. corner sec. 29, T. 6 S., R. 26 E.

A11—0 to 4 inches, dark grayish-brown (10YR 4/2) loam, very dark grayish brown (10YR 3/1) moist; moderate, medium, crumb structure; soft, friable, nonsticky and slightly plastic; many fine and very fine roots; clear, smooth boundary.

A12—4 to 8 inches, dark grayish-brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; weak, coarse, prismatic structure parting to moderate, coarse, crumb; slightly hard, friable, slightly sticky and slightly plastic; many fine and very fine roots; clear, wavy boundary.

B1—8 to 14 inches, dark grayish-brown (10YR 4/2) loam, dark brown (10YR 3/2) moist; weak, coarse, prismatic structure parting to weak, medium, blocky; hard, friable, sticky and plastic; common fine and very fine roots; clear, wavy boundary.

B21—14 to 19 inches, pale-brown (10YR 5/3) clay loam, dark yellowish brown (10YR 3/4) moist; moderate, coarse, prismatic structure parting to mod-

erate, coarse, blocky; hard, friable, sticky and plastic; common fine and very fine roots; thin clay bridgings between sand grains; clear, wavy boundary.

B22—19 to 23 inches, pale-brown (10YR 5/3) clay loam, dark yellowish-brown (10YR 3/4) moist; moderate, coarse, prismatic structure parting to moderate, medium and coarse, blocky; hard, friable, sticky and plastic; common fine and very fine roots; gradual, wavy boundary.

B23—23 to 26 inches, pale-brown (10YR 5/3) clay loam, brown (10YR 5/3) moist; moderate, coarse, prismatic structure parting to moderate, medium, blocky; hard, firm, sticky and plastic; few fine and medium roots; many medium pores; gradual, wavy boundary.

B24—26 to 40 inches, pale-brown (10YR 5/3) clay loam, brown (10YR 5/3) moist; weak, medium, prismatic structure parting to weak, medium, blocky; hard, firm, sticky and plastic; few fine and medium roots; many medium and coarse pores; clear, wavy boundary.

C—40 to 47 inches, red clay shale.

The dark grayish-brown A and B horizons range from 14 to 40 inches in combined thickness. The material between depths of 10 and 40 inches is loam or clay loam. Depth to pink and red shale is more than 40 inches. The A1 horizon and the upper part of the B2 horizon are dark brown, brown, grayish brown, and pale brown.

Adel-Mayflower association, sloping (AO).—This association is made up of soils on hillsides above sheer limestone walls. It is about 70 percent Adel loam and 30 percent Mayflower silt loam. Slopes are mostly 4 to 8 percent, but they range to 15 percent. In places the soils are below the sandstone ridges. The Adel soil in this association has the profile described as representative of the Adel series. Included in mapping are small seeps and springs that have a cover of aspen trees.

Runoff is rapid, and the hazard of erosion is moderate. These soils are used for range, wildlife, recreation, watershed, and pasture. Capability unit IVe–2 dryland; Silty range site, 20- to 24-inch precipitation zone; windbreak suitability group 1.

Adger Series

The Adger series consists of deep, nearly level to sloping and gently undulating and undulating, well-drained, sodium-affected soils on fans, foot slopes, terraces, and shale uplands. Slopes range from 0 to 8 percent. These soils formed in clay alluvium. Elevation ranges from 3,700 to 4,500 feet.

The native vegetation is mainly western wheatgrass, big sagebrush, Sandberg bluegrass, rubber rabbitbush, and western yarrow. Annual precipitation is 14 to 16 inches, the average annual soil temperature is 46° to 47° F, and the frost-free period is 110 to 120 days.

In a representative profile the surface layer is light brownish-gray loam about 1 inch thick. The subsoil is dark grayish-brown, grayish-brown, and light yellowish-brown clay, about 17 inches thick, that is very hard when dry. The substratum is light yellowish-brown silty clay that extends to a depth of 60 inches or more.

Permeability is slow, and available water capacity is moderate or high. The effective rooting depth is 60 inches or more. These soils are used mainly for range, wildlife, recreation, and watershed, but a few small areas are used for dryfarmed crops.

Representative profile of Adger clay, 0 to 8 percent slopes, in grassland, 2,640 feet south and 100 feet east of the NW. corner sec. 21, T. 8 S., R. 33 E.

A2—0 to 1 inch, light brownish-gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; moderate, thin, platy structure; hard, friable, slightly sticky and slightly plastic; many very fine roots; abrupt, smooth boundary.

B21t—1 inch to 6 inches, dark grayish-brown (2.5Y 4/2) clay, very dark grayish brown (2.5Y 3/2) moist; moderate, medium, prismatic structure parting to weak, medium and fine, blocky; very hard, very firm, very sticky and very plastic; common very fine roots; many clean sand grains coating the tops of the prisms; clear, wavy boundary.

B22t—6 to 10 inches, grayish-brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; moderate, fine and medium, blocky structure; very hard, very firm, very sticky and very plastic; few very fine roots; common very fine tubular pores; slightly effervescent; clear, wavy boundary.

B3cs—10 to 18 inches, light yellowish-brown (2.5Y 6/4) clay, dark grayish brown (2.5Y 4/2) moist; strong, medium and fine, blocky structure; very hard, very firm, very sticky and very plastic; few roots; common very fine tubular pores; slightly effervescent; common fine and medium gypsum crystals; clear, wavy boundary.

C1—18 to 29 inches, light yellowish-brown (2.5Y 6/4) silty clay, dark grayish brown (2.5Y 4/2) moist; weak, medium, blocky structure; very hard, firm, very sticky and plastic; few roots; common very fine tubular pores; strongly effervescent; common fine and medium threads and soft masses of lime; gradual, wavy boundary.

C2—29 to 60 inches, light yellowish-brown (2.5Y 6/4) silty clay, dark grayish brown (2.5Y 4/2) moist; massive; very hard, firm, very sticky and plastic; strongly effervescent; few fine threads and soft masses of lime.

Depth to the horizon of gypsum accumulation ranges from 10 to 18 inches. The A2 horizon ranges from light gray to light brownish gray when dry. The B2t and Bcs horizons are 50 to 60 percent clay. They range from light yellowish brown to grayish brown when dry.

Adger clay, 0 to 8 percent slopes (Ap).—This soil is on fans and terraces and shale hills that are partly covered by windblown alluvium. Areas are 10 to 15 acres in size. Slopes are 0 to 2 percent on the terraces, 2 to 4 percent on the fans, and 2 to 8 percent on the hills. Included in mapping are small areas of Lennep loam and Nobe clay.

Runoff is moderate, and the hazard of erosion is slight. This soil is used for range, wildlife, recreation, and watershed. Capability unit VIs–1 dryland; Clayey range site, 15- to 19-inch precipitation zone; windbreak suitability group 3S.

Alice Series

The Alice series consists of deep, gently sloping and strongly sloping and rolling, well-drained soils on narrow foot slopes, fans, and valley bottoms. Slopes range from 4 to 15 percent. These soils formed in sandy alluvium derived from calcareous sandstone. Elevation ranges from 2,900 to 3,700 feet.

The native vegetation is green sagewort, little bluestem, prairie sandreed, side-oats grama, blue grama, broom snakeweed, ragweed, and eriogonum. Annual

precipitation is 13 to 14 inches, the average annual soil temperature is 47° to 49° F, and the frost-free period is 115 to 125 days.

In a representative profile the surface layer is grayish-brown fine sandy loam about 2 inches thick. The subsoil is grayish-brown and light olive-brown sandy loam about 10 inches thick. The substratum is light olive-brown, light yellowish-brown, and pale-yellow sandy loam and loamy sand that extends to a depth of 65 inches or more.

Permeability is moderately rapid, and available water capacity is moderate. The effective rooting depth is 60 inches or more. Most of these soils are used for range, wildlife, recreation, and watershed. Small areas are used for dryfarmed hay.

Representative profile of Alice fine sandy loam, 4 to 15 percent slopes, in grassland, 990 feet east and 330 feet south of the NW. corner sec. 2, T. 1 S., R. 35 E.

A—0 to 2 inches, grayish-brown (2.5Y 5/2) fine sandy loam, very dark grayish brown (2.5Y 3/2) moist; weak, coarse, crumb structure parting to single grained; soft, very friable, nonsticky and slightly plastic; many fine and very fine roots; clear, smooth boundary.

B21—2 to 6 inches, grayish-brown (2.5Y 5/2) sandy loam, very dark grayish brown (2.5Y 3/2) moist; moderate, coarse, prismatic structure; slightly hard, friable, slightly sticky and slightly plastic; common fine roots; gradual, wavy boundary.

B22—6 to 12 inches, light olive-brown (2.5Y 5/4) sandy loam, olive brown (2.5Y 4/4) moist; massive; slightly hard, friable, nonsticky and slightly plastic; common fine roots; gradual, wavy boundary.

C1—12 to 17 inches, light olive-brown (2.5Y 5/4) light sandy loam, olive brown (2.5Y 4/4) moist; massive; slightly hard, friable, nonsticky and slightly plastic; few very fine roots; slightly effervescent; clear, smooth boundary.

C2—17 to 28 inches, light yellowish-brown (2.5Y 6/4) light sandy loam, light olive brown (2.5Y 5/4) moist; massive; hard, friable, nonsticky and slightly plastic; few very fine roots; slightly effervescent; few fine, soft lime masses; gradual, wavy boundary.

C3—28 to 41 inches, light yellowish-brown (2.5Y 6/4) light sandy loam, light olive brown (2.5Y 5/4) moist; massive; slightly hard, friable, nonsticky and slightly plastic; few very fine roots; slightly effervescent; gradual, wavy boundary.

C4—41 to 65 inches, pale-yellow (2.5Y 7/4) heavy loamy sand, olive (2.5Y 4/4) moist; massive; slightly hard, very friable; nonsticky and slightly plastic; slightly effervescent.

The A horizon ranges from dark grayish-brown to light olive-brown sandy loam or fine sandy loam. The B2 horizon ranges from 5 to 10 inches in thickness. It is 12 to 18 percent clay.

Alice fine sandy loam, 4 to 15 percent slopes (Ar).—This soil is on foot slopes, fans, and valley bottoms in 20– to 30–acre areas. Slopes are smooth, and they are mostly 4 to 10 percent. Steeper slopes occur below the higher hills and the residual soils that border the deep valleys. Slopes are 200 to 400 feet long.

Included with this soil in mapping are small areas of Olney fine sandy loam on large fans. Also included are narrow bands, 50 to 75 feet wide, of Glenberg fine sandy loam below the sandstone ledges.

Runoff is slow, and the hazard of soil blowing is severe. This soil is used for range, hay, wildlife, recreation, watershed, and dryfarmed crops. Capability unit IIIe–3 dryland; Sandy range site, 10- to 14-inch precipitation zone; windbreak suitability group 2M.

Allentine Series

The Allentine series consists of deep, nearly level to sloping, well-drained soils on broad fans, ridgetops, and terraces and in stream bottoms. Slopes range from 0 to 8 percent. These soils formed in clayey alluvium. Elevation ranges from 2,700 to 3,300 feet.

The native vegetation is mainly western wheatgrass, prairie junegrass, green needlegrass, big sagebrush, curlycup gumweed, and greasewood. Annual precipitation is 12 to 13 inches, the average annual soil temperature is 47° to 49° F, and the frost-free period is 115 to 125 days.

In a representative profile the surface layer is light-gray silt loam about 2 inches thick. The subsoil is grayish-brown and light brownish-gray clay about 25 inches thick. The substratum is pale-olive and light-olive gray clay and silty clay that extends to a depth of 60 inches or more.

Permeability is very slow, and available water capacity is moderate or high. The effective rooting depth is 60 inches or more. These soils are used for range, wildlife, recreation, watershed, and irrigated and dryfarmed crops.

Representative profile of Allentine clay, 0 to 2 percent slopes, in grassland, 1,980 feet south and 300 feet east of the NW. corner sec. 30, T. 1 S., R. 32 E.

A2—0 to 2 inches, light-gray (2.5Y 7/2) silt loam, dark grayish brown (2.5Y 4/2) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; many fine and few medium roots; many vesicular pores; abrupt, smooth boundary.

B1—2 to 4 inches, grayish-brown (2.5Y 5/2) light clay, dark grayish brown (2.5Y 4/2) moist; weak, medium, prismatic structure parting to moderate, fine, blocky; very hard, very sticky and very plastic; many fine and few medium roots; clear, smooth boundary.

B21t—4 to 9 inches, grayish-brown (2.5Y 5/2) heavy clay, dark grayish brown (2.5Y 4/2) moist; moderate, coarse, prismatic structure parting to strong, fine, blocky; extremely hard, very firm, very sticky and very plastic; common very fine and fine roots; thin, continuous and patchy, thick clay films on peds; clear, smooth boundary.

B22t—9 to 20 inches, light brownish-gray (2.5Y 6/2) heavy clay, dark grayish brown (2.5Y 4/2) moist; weak, medium, blocky structure; extremely hard, very firm, very sticky and very plastic; common fine and very fine roots; thin, patchy clay films on peds; strongly effervescent; few fine lime mottles; gradual, wavy boundary.

B3—20 to 27 inches, light brownish-gray (2.5Y 6/2) clay, dark grayish brown (2.5Y 4/2) moist; weak, coarse, blocky structure; extremely hard, very firm, very sticky and very plastic; few fine and very fine roots; strongly effervescent; few fine lime mottles; gradual, wavy boundary.

C1cs—27 to 34 inches, pale-olive (5Y 6/3) clay, olive (5Y 4/3) moist; weak, coarse, blocky structure; extremely hard, very firm, very sticky and very plastic; few fine and very fine roots; strongly effervescent; few medium gypsum and salt crystals; gradual, wavy boundary.

C2cs—34 to 48 inches, pale-olive (5Y 6/3) silty clay, olive (5Y 4/3) moist; massive; very hard, firm, very sticky and very plastic; few fine and very fine

roots; strongly effervescent; common fine gypsum and salt crystals; gradual, wavy boundary.
C3—48 to 60 inches, light olive-gray (5Y 6/2) clay, olive (5Y 4/3) moist; massive; very hard, firm, very sticky and very plastic; few fine pebbles; strongly effervescent; few coarse gypsum and lime mottles.

Depth to lime ranges from 8 to 12 inches, and depth to gypsum, from 12 to 30 inches. The B2t horizon is clay or silty clay loam.

Allentine clay, 0 to 2 percent slopes (Asa).—This soil is in valley bottoms and on terraces. Areas range from 10 to 30 acres in size. The soil has the profile described as representative of the series. Included in mapping are small areas of Bone clay and Vananda clay.

Runoff is slow, and the hazard of erosion is slight. This soil is used mainly for range, recreation, and wildlife, but small areas are used for hay and irrigated crops. Capability unit VIs–1 dryland, IVs–1 irrigated; Clayey range site, 10- to 14-inch precipitation zone; windbreak suitability group 2S.

Allentine clay, 2 to 4 percent slopes (Asb).—This gently sloping soil is on fans, at the heads of drainageways, and on wide ridgetops. Slopes are mostly 2 or 3 percent and range from 150 to 350 feet long. The soil has a profile similar to the one described as representative of the series, but it is steeper.

Included with this soil in mapping are small areas of a soil that is underlain by clay shale at a depth of 40 to 60 inches and small spots of Pierre clay.

Runoff is medium, and the hazard of erosion is slight. This soil is used mainly for range, recreation, and wildlife, but small areas are used for hay and irrigated crops. Capability unit VIs–1 dryland, IVs–1 irrigated; Clayey range site, 10- to 14-inch precipitation zone; windbreak suitability group 2S.

Allentine-Bone complex, 0 to 1 percent slopes (Asc).—This complex is made up of nearly level soils on fans and terraces. It is 55 to 65 percent Allentine silty clay loam, 15 to 30 percent Bone silty clay, and about 10 percent Vananda clay. The soils are intermixed. The land surface is uneven. The Bone soil is in 3– to 6–inch microdepressions. The soils in this complex have profiles similar to the ones described as representative of their respective series, but there are a few pebbles on the surface.

Runoff is slow, and the hazard of erosion is slight. These soils are used for range, wildlife, and recreation. They are suitable for some irrigated crops and hay. Capability unit VIs–1 dryland, IVs–1 irrigated; Pan Spots range site, 10- to 14-inch precipitation zone; windbreak suitability group 3S.

Allentine-Bone complex, 1 to 4 percent slopes (Asd).—This complex is made up of nearly level and gently sloping soils on fans and narrow terraces. It is about 60 percent Allentine silty clay loam, 30 percent Bone silty clay, and 10 percent Vananda silty clay. Slopes are mostly less than 3 percent. The Bone soil is in 2– to 6–inch microdepressions. The soils in this complex have profiles similar to the ones described as representative of their respective series, but there are a few pebbles on the surface.

Runoff is medium, and the hazard of erosion is slight. These soils are used for range, wildlife, and recreation. Capability unit VIs–dryland; Pan Spots range site, 10- to 14-inch precipitation zone; windbreak suitability group 3S.

Alluvial Land

Three units of Alluvial land are mapped in the Area. They are described in the following paragraphs.

Alluvial land, gravelly (ATa).—These are gravelly soils in narrow valleys and on gravel bars on the river flood plain. Runoff and stream flooding are active in mixing and changing the material yearly. Slopes range from 0 to 4 percent. The material ranges from sand and loamy sand to very gravelly sand and sandy gravel. In places there is a 6– to 10–inch surface layer of loam, sandy loam, and gravelly loam over the loose material.

Runoff is very slow, and the hazard of erosion and flooding is severe. Alluvial land, gravelly, is used for range, wildlife, and recreation. Capability unit VIs–1 dryland; Shallow to Gravel range site, 10- to 14-inch precipitation zone; windbreak suitability group 4.

Alluvial land, cobbly (ATb).—These are very stony, gravelly, and cobbly silt loam and loam alluvium soils on flood plains, in valley bottoms, and on fans in mountain valleys. Areas are generally less than 300 feet wide and have a single stream channel or a braided system of several shallow channels on the valley bottom. The single channel generally has perpendicular sides and is actively eroding, and the braided channels are vegetated. Some small terraces are included in the areas where tributary drainageways empty into main valleys. Slopes are 0 to 1 percent on the channel bottoms and the flood plains and 3 or 4 percent on the sides of the braided channels. Stream channels are cut 2 to 5 feet below the level of the flood plain. About 30 percent of the land surface is covered with coarse fragments of stone, gravel, and cobble size. The amount of coarse fragments in the alluvium ranges from 25 to 75 percent. Depth to loose material ranges from 0 to 24 inches.

Runoff is slow, and the hazard of erosion is severe. Flooding is frequent. Alluvial land, cobbly, is used mainly for range, wildlife, and recreation. Capability unit VIs–1 dryland; Shallow to Gravel range site, 15- to 19-inch precipitation zone; windbreak suitability group 3M.

Alluvial land, wet (ATc).—These are nonsaline mixed loam, silt loam, and silty clay loam alluvium soils in major perennial stream valleys. The stream channels are cut 2 to 5 feet below the level of the bordering narrow, irregularly shaped, low terraces and small fans. The water table is generally at a depth of about 3 feet, but it ranges from 1 foot to 5 feet below the surface. Areas range from 150 to 800 feet wide and are widest in the river valleys. They are sometimes flooded during spring runoff. Slopes are mostly 0 to 2 percent. Depth of the alluvium ranges from 24 to more than 60 inches. The material on the river flood plains in many places is gravelly and sandy below a depth of 24 inches. Heavy growths of brushy plants are common on most of the mapped areas.

Runoff is slow, and the hazard of flooding and erosion is severe. Alluvial land, wet, is used for range, pasture, recreation, and wildlife. Capability unit IVw–2

dryland; Wet Land range site, 15- to 19-inch precipitation zone; windbreak suitability group 3W.

Amherst Series

The Amherst series consists of shallow, undulating to hilly, well-drained soils on high hills in tilted sedimentary uplands. Slopes range from 4 to 35 percent. These soils are underlain by hard, platy shale and sandstone at a depth of 10 to 20 inches. They formed in place in material weathered from the bedrock. Elevation ranges from 3,600 to 4,300 feet.

The native vegetation is bluebunch wheatgrass, Idaho fescue, western wheatgrass, prairie junegrass, blue grama, fringed sagewort, and big sagebrush. Annual precipitation is 14 to 16 inches, the average annual soil temperature is 45° to 47° F, and the frost-free period is 100 to 110 days.

In a representative profile the surface layer is dark grayish-brown silty clay loam about 2 inches thick. The subsoil is dark-brown, brown, and light olive-brown silty clay loam and clay about 17 inches thick. Hard platy shale is at a depth of 19 inches.

Permeability is moderate, and available water capacity is very low. The effective rooting depth is about 19 inches. Root mats form in the upper several inches of the bedrock. These soils are used for range, recreation, wildlife, watershed, and dryfarmed crops.

Representative profile of Amherst silty clay loam, in an area of Amherst complex, rolling, in grassland, 1,980 feet north and 200 feet west of the SE. corner sec. 14, T. 5 S., R. 28 E.

A—0 to 2 inches, dark grayish-brown (10YR 4/2) silty clay loam, dark brown (10YR 3/3) moist; moderate, fine, granular structure; hard, firm, sticky and plastic; many very fine roots; 5 percent (volume) flat, hard shale fragments of channer sizes; clear, smooth boundary.

B1—2 to 5 inches, dark-brown (10YR 4/3) silty clay loam, dark brown (10YR 3/3) moist; moderate, fine, blocky structure; dry, firm, very sticky and very plastic; many very fine roots; few ¼-inch shale fragments; clear, smooth boundary.

B2t—5 to 9 inches, brown (10YR 5/3) clay, dark brown (10YR 4/3) moist; moderate, medium, prismatic structure parting to strong, fine, blocky; very hard, very firm, very sticky and very plastic; common very fine roots; moderately thick, patchy clay films on peds; 5 percent (volume) flat fragments of channer size; clear, wavy boundary.

B3—9 to 19 inches, light olive-brown (2.5Y 5/4) light clay, olive brown (2.5Y 4/4) moist; weak, medium, prismatic structure parting to moderate, medium, blocky; hard, firm, sticky and plastic; common very fine roots; 10 to 45 percent (volume) hard shale fragments of channer size; abrupt, wavy boundary.

R—19 to 23 inches, hard platy shale and about 20 percent clay-filled interstices; moderately effervescent; lime casts on bottom of shale fragments.

Depth to hard bedrock ranges from 10 to 20 inches. Coarse fragments of shale in places cover as much as 15 percent of the soil surface. The volume of coarse fragments ranges from 0 to 15 percent in the upper 10 inches and from 10 to 50 percent in the lower part of the soil. The A horizon is loam or silty clay loam. The B2t horizon ranges from dark brown to grayish brown. It is 35 to 50 percent clay.

Amherst loam, undulating (Au).—This soil is on wide, smooth ridges and knolls in tilted sedimentary uplands. Slopes range from 4 to 8 percent. The soil has a profile similar to the one described as representative of the series, but it is steeper and has a surface layer of loam. Included in mapping are small spots of Castner loam and Rock outcrop.

Runoff is medium, and the hazard of erosion is moderate. This soil is used for range, hay, wildlife, recreation, watershed, and dryfarmed crops. Capability unit IVe–2 dryland; Silty range site, 15- to 19-inch precipitation zone; windbreak suitability group 3M.

Amherst loam, rolling (AVa).—This soil is on hills and ridges in tilted sedimentary uplands. Slopes are mostly 8 to 10 percent, but they are steeper in the main drainageways. Slopes are 200 to 350 feet long. The soil has a profile similar to the one described as representative of the series, but it has a surface layer of loam that in places has a few siliceous pebbles from weathered conglomerate rock, and in some areas it has a substratum that is light brown to pinkish gray and that contains fragments of hard, noncalcareous sandstone. Included in mapping are small spots of Rock outcrop and Castner loam.

Runoff is medium, and the hazard of erosion is moderate. This soil is used mostly for range, hay, wildlife, recreation, and watershed. A few areas are included with less steep soils and are used for dryfarmed crops. Capability unit IVe–2 dryland; Silty range site, 15- to 19-inch precipitation zone; windbreak suitability group 3M.

Amherst complex, rolling (AVb).—This complex is made up of rolling soils on ridges and hills in tilted sedimentary uplands. It is about 65 percent Amherst silty clay loam and clay loam and 35 percent Castner loam, Rock outcrop, and Reeder loam. Slopes are mostly 10 to 15 percent and range from 150 to 300 feet long. The longest slopes are on the north faces of the anticlines. The Amherst soil in this complex has the profile described as representative of the Amherst series.

Runoff is medium, and the hazard of erosion is moderate. These soils are used for range, wildlife, recreation, and watershed. Capability unit VIe–1 dryland; Silty range site, 15- to 19-inch precipitation zone; windbreak suitability group 3M.

Amherst complex, hilly (AVc).—This complex is made up of hilly soils on a succession of roughly parallel ridges and narrow drainageways in tilted sedimentary uplands. It is about 50 percent Amherst silty clay loam; 35 percent Reeder, Absarokee, Regent, and Eltsac soils; and 15 percent Rock outcrop and Shale outcrop. Slopes are mostly 15 to 25 percent, but they range to 35 percent. Erosion has exposed the various-textured strata of bedrock. Shale outcrop, Rock outcrop, and the Eltsac soil are mostly on the steeply sloping south sides of the ridges. The Reeder, Absarokee, and Regent soils are on the smooth, north-facing slopes of the tilted bedrock. Shale outcrop has slopes of as much as 60 percent.

Runoff is rapid, and the hazard of erosion is severe. These soils are used for range, wildlife, recreation, and watershed. Capability unit VIe–1 dryland; Thin Hilly range site, 15- to 19-inch precipitation zone; windbreak suitability group 4.

Amherst-Maginnis complex, hilly (AVd).—This complex is made up of hilly and very steep soils on rough, broken hills, ridges, and escarpments in the sedimen-

tary uplands. It is about 40 percent Amherst loam, 35 percent Maginnis channery loam, and 25 percent platy, hard Shale outcrop and Rock outcrop. Slopes range from 15 to 35 percent on the Amherst and Maginnis soils and to as much as 75 percent on the Shale outcrop. Slopes are 75 to 200 feet long. The Amherst soil is on rounded ridgetops and hilltops and the upper sides of valleys. The Maginnis soil is on the lower sides of valleys, on narrow ridges, and along the top edge of rock escarpments.

Runoff is rapid, and the hazard of erosion is severe. These soils are used for range, watershed, recreation, and wildlife. Capability unit VIIe–1 dryland; Thin Hilly range site, 15- to 19-inch precipitation zone; windbreak suitability group 4.

Armington Series

The Armington series consists of deep, gently sloping to steep and rolling, well-drained soils on hills and ridges of divides between mountain valleys and canyons. Slopes are mostly 4 to 15 percent, but they range to 35 percent. These soils formed in alluvium or in material weathered in place from shale. Elevation ranges from 4,000 to 6,000 feet.

The native vegetation is green needlegrass, western wheatgrass, chokecherry, cinquefoil, sedges, Idaho fescue, thornapple, and prairie junegrass. Annual precipitation is 15 to 18 inches, the average annual soil temperature is 41° to 46° F, and the frost-free period is 90 to 115 days.

In a representative profile the surface layer is reddish-brown silty clay loam about 4 inches thick. The subsoil, about 29 inches thick, is reddish-brown and weak-red clay. The substratum is red clay that extends to a depth of 60 inches or more.

Permeability is very slow, and available water capacity is moderate or high. The effective rooting depth is 60 inches or more. These soils are used for range, wildlife, recreation, and watershed.

Representative profile of Armington silty clay loam, in grassland, 1,980 feet north and 660 feet east of the SW. corner sec. 34, T. 4 S., R. 29 E.

A1—0 to 4 inches, reddish-brown (5YR 4/3) silty clay loam, dark reddish brown (5YR 3/3) moist; thick, platy structure parting to strong, very fine, subangular blocky; hard, firm, very sticky and very plastic; common fine and very fine and few medium roots; 10 percent limestone, chert, and shale fragments; gradual boundary.

B1—4 to 11 inches, reddish-brown (5YR 4/3) clay, dark reddish brown (5YR 3/3) moist; moderate, fine, prismatic structure parting to strong, fine and medium, blocky; hard, firm, very sticky and very plastic; few very fine, fine, and medium roots; common fine and medium tubular pores; strong effervescence; clear boundary.

B21—11 to 16 inches, weak-red (10YR 5/4) clay, red (10YR 4/6) moist; moderate, fine, prismatic structure parting to strong, fine and medium, blocky; very hard, firm, very sticky and very plastic; few very fine, fine, and medium roots; common fine and medium tubular pores; 10 percent (volume) limestone and chert fragments; strong effervescence; gradual boundary.

B22—16 to 33 inches, weak-red (10YR 5/4) clay, red (10YR 4/6) moist; strong, medium and coarse, prismatic structure parting to strong, coarse, blocky; few slickensides; extremely hard, very firm, very sticky and very plastic; few roots, mainly between peds; few fine and medium tubular pores; strong effervescence; few lime masses; gradual boundary.

C—33 to 60 inches, red (10YR 5/6) clay, red (10YR 4/6) moist; massive; extremely hard, very firm, very sticky and very plastic; few roots; few fine pores; strong effervescence.

Depth to the calcareous layer ranges from 4 to 10 inches. The A1 horizon ranges from dark-brown to reddish-brown silty clay loam, silty clay, or clay. The B2 horizon ranges from weak red to reddish brown.

Armington silty clay loam (AWa).—This soil is on the smooth upper parts and north and east sides of ridges and hills and at the heads of drainageways. Areas range from 20 to 120 acres in size. Slopes are mostly 12 to 15 percent but range to 8 percent on ridgetops. The soil has the profile described as representative of the series. Included in mapping are small areas of Darret soils.

Runoff is medium, and the hazard of erosion is moderate. This soil is used for range, hay, pasture, recreation, watershed, and wildlife. Capability unit IVe–2 dryland; Clayey range site, 15- to 19-inch precipitation zone; windbreak suitability group 2M.

Armington complex, rolling (AWb).—This complex is made up of soils that have a surface layer of silty clay loam and clay. It is in bands on foot slopes below shale and sandstone escarpments. The foot slopes are typically dissected by narrow drainageways, 10 to 30 feet deep. Slopes are short. They range from 8 to 15 percent but are mostly 12 to 15 percent. The Armington silty clay loam in this complex has the profile described as representative of the Armington series. The Armington clay has a profile similar to the one described as representative, but the surface layer is clay.

Included with these soils in mapping are small areas of red soils that are similar to Allentine soils. Also included in places are small fans and knolls of shale bedrock.

Runoff is rapid, and the hazard of erosion is moderate. These soils are used for range, wildlife, recreation, watershed, and pasture. Capability unit IVe–2 dryland; Clayey range site, 15- to 19-inch precipitation zone; windbreak suitability group 2M.

Arnegard Series

The Arnegard series consists of deep, gently sloping to steep and hilly, well-drained soils on fans and foot slopes. Slopes range from 2 to 35 percent. These soils formed in alluvium derived from mixed rocks in small stream valleys. Elevation ranges from 3,500 to 4,800 feet.

The native vegetation is mainly Sandberg bluegrass, green needlegrass, snowberry, and horsemint. Annual precipitation is 14 to 17 inches, the average annual soil temperature is 44° to 46° F, and the frost-free period is 110 to 115 days.

In a representative profile the surface layer is very dark grayish-brown and very dark gray loam about 14 inches thick. The subsoil is dark-gray clay loam about 17 inches thick. The substratum is dark grayish-brown, dark-brown, and brown clay loam and loam that extends to a depth of 61 inches or more.

Permeability is moderate, and available water capacity is high. The effective rooting depth is 60 inches or more. These soils are used for range, wildlife, recreation, watershed, and irrigated and dryfarmed crops.

Representative profile of Arnegard loam, 8 to 15 percent slopes, in grassland, 660 feet south and 180 feet east of the center of sec. 12, T. 7 S., R. 37 E.

A—0 to 5 inches, very dark grayish-brown (10YR 3/2) loam, black (10YR 2/1) moist; weak, very fine, crumb structure; soft, very friable, nonsticky and slightly plastic; many fine roots; gradual boundary.

AB—5 to 14 inches, very dark gray (10YR 3/1) loam, black (10YR 2/1) moist; weak, medium, prismatic structure parting to weak, fine, subangular blocky; soft, very friable, slightly sticky and slightly plastic; common fine roots; gradual, wavy boundary.

B—14 to 31 inches, dark-gray (10YR 4/1) clay loam, very dark gray (10YR 2/1) moist; weak, coarse, prismatic structure parting to weak, coarse, blocky; hard, friable, slightly sticky and plastic; common fine roots; gradual boundary.

C1—31 to 43 inches, dark grayish-brown (10YR 4/2) clay loam, very dark brown (10YR 2/2) moist; weak, coarse, prismatic structure parting to weak, coarse, blocky; hard, friable, slightly sticky and plastic; a few fine roots; clear, wavy boundary.

C2—43 to 56 inches, dark-brown (10YR 4/3) clay loam, very dark brown (10YR 2/2) moist; massive; hard, friable, sticky and plastic; few fine roots; clear, wavy boundary.

C3—56 to 61 inches, brown (10YR 5/3) loam, very dark grayish brown (10YR 3/2) moist; massive; hard, firm, sticky and plastic; slightly effervescent.

The dark-colored surface layer ranges from 20 to 50 inches in thickness. The A horizon is brown, dark-brown, dark grayish brown, and very dark grayish-brown loam and silt loam. The B horizon is 20 to 30 percent clay. The C horizon is dark grayish brown, light brown, brown, and grayish brown.

Arnegard loam, 8 to 15 percent slopes (Axa).—This soil is on foot slopes and fans. Slopes are mostly 12 to 15 percent on the foot slopes and 8 percent on the fans. The soil has the profile described as representative of the series.

Runoff is medium, and the hazard of erosion is moderate. This soil often receives runoff from soils above it. It is used for range, wildlife, recreation, watershed, dryfarmed crops, and hay. Capability unit IVe–2 dryland; Silty range site, 15- to 19-inch precipitation zone; windbreak suitability group 1.

Arnegard silt loam, 2 to 4 percent slopes (Axb).—This soil is on fans and terraces. Slopes are mostly 2 percent and range from 150 to 300 feet long. The soil has a profile similar to the one described as representative of the series, but it is less steep, the surface layer is silt loam, and the lower part of the substratum in places contains thin lenses of gravelly red shale and chips of sandstone. Included in mapping are small areas of Farnuf loam.

Runoff is medium, and the hazard of erosion is slight. Most areas receive runoff from soils above them or from drainageways. This soil is used for irrigated and dryfarmed crops, hay, wildlife, recreation, and range. Capability unit IIe–2 dryland, IIe–1 irrigated; Silty range site, 15- to 19-inch precipitation zone; windbreak suitability group 1.

Arnegard silt loam, 4 to 8 percent slopes (Axc).—This soil is on fans and foot slopes. Slopes are mostly 7 and 8 percent. The soil has a profile similar to the one described as representative of the series, but the surface layer is silt loam and in places the lower part of the substratum is reddish-brown silt loam.

Included with this soil in mapping are spots of Farnuf loam. In a few areas these included soils make up 30 percent of the area of this mapping unit.

Runoff is medium, and the hazard of erosion is moderate. Most areas receive runoff from soils above them or from tributary valleys. This soil is used for dryfarmed crops, hay, wildlife, recreation, watershed, and range. Capability unit IIIe–2 dryland; Silty range site, 15- to 19-inch precipitation zone; windbreak suitability group 1.

Arvada Series

The Arvada series consists of deep, nearly level and gently sloping, well-drained, alkali-affected soils on fans, terraces, and valley bottoms. Slopes range from 0 to 4 percent. These soils formed in mixed clay and loam alluvium. Elevation ranges from 2,800 to 3,800 feet. The native vegetation is a sparse stand of salt- and alkali-tolerant forbs, greasewood, alkali sacaton, inland saltgrass, and western wheatgrass.

Annual precipitation is 12 to 14 inches, the average annual soil temperature is 47° to 49° F, and the frost-free period is 115 to 125 days.

In a representative profile the surface layer is grayish-brown and light brownish-gray silt loam about 3 inches thick. The subsoil is grayish-brown clay and silty clay about 15 inches thick. The substratum is grayish-brown and pale-brown silty clay that extends to a depth of 60 inches or more.

Permeability is very slow, and available water capacity is moderate or high. The effective rooting depth is 60 inches or more. These soils are used mostly for range, recreation, and wildlife. A few areas are mixed with other soils and are used for dryfarmed crops.

Representative profile of Arvada silty clay loam, in grassland, 1,980 feet south and 660 feet west of the NE. corner of sec. 14, T. 4 S., R. 30 E.

A21—0 to 2 inches, grayish-brown (10YR 5/2) silt loam, dark grayish brown (10YR 4/2) moist; weak, thin, platy structure; soft, very friable, nonsticky and slightly plastic; common vesicular pores; abrupt, smooth boundary.

A22—2 to 3 inches, light brownish-gray (10YR 6/2) silt loam, dark brown (10YR 4/3) moist; moderate, very thin, platy structure; soft, very friable, nonsticky and slightly plastic; common vesicular pores; many clean sand grains coating the tops of the plates; abrupt, smooth boundary.

B2t—3 to 13 inches, grayish-brown (10YR 5/2) clay, very dark grayish brown (10YR 3/2) moist; strong, medium, prismatic structure parting to strong, medium, blocky; extremely hard, very firm, very sticky and very plastic; moderately thick, patchy clay films on peds; few fine roots; clear, wavy boundary.

B3cacs—13 to 18 inches, grayish-brown (10YR 5/2) silty clay, dark grayish brown (10YR 4/2) moist; moderate, medium, blocky structure; strongly effervescent; few fine lime threads and gypsum crystals; gradual, wavy boundary.

C1—18 to 30 inches, grayish-brown (10YR 5/2) silty clay, dark grayish brown (10YR 4/2) moist; massive; very hard, very firm, very sticky and very plastic; strongly effervescent; gradual, wavy boundary.

C2—30 to 60 inches, pale-brown (10YR 6/3) silty clay, dark yellowish brown (10YR 3/4) moist; massive; very hard, firm, sticky and plastic; strongly effervescent.

Depth to calcareous material ranges from 8 to 18 inches. The A2 horizon ranges from grayish brown to light gray. The B2t horizon is clay, clay loam, and silty clay. The C2 horizon in places is stratified with loam, silt loam, and sandy loam below a depth of 30 inches.

Arvada silty clay loam (Ayd).—This soil is on fans and terraces. Slopes are mostly 0 to 2 percent, but they range to 4 percent along shallow drainageways and at the edges of terraces. The soil has the profile described as representative of the series.

Included with this soil in mapping are areas of Bone clay in microdepressions. These included soils make up about 10 percent of the area of this mapping unit.

Runoff is slow, and the hazard of erosion is slight. This soil is used for range, wildlife, and recreation. Capability unit VIs–1 dryland; Clayey range site, 10- to 14-inch precipitation zone; windbreak suitability group 3S.

Arvada-Bone clays (Aye).—This complex is made up of nearly level and gently sloping soils on small terraces and fans. It is 60 to 80 percent Arvada clay, 15 to 30 percent Bone clay, and 5 to 10 percent Hydro silty clay loam. The nearly barren Bone soil is in distinct microdepressions, 3 to 8 inches deep. Slopes are 1 percent or less on the terraces and 3 to 4 percent on the fans and the terrace edges.

Runoff is slow, and the hazard of erosion is slight. These soils are used for range, wildlife, and recreation. Capability unit VIs–1 dryland; Pan Spots range site, 10- to 14-inch precipitation zone; windbreak suitability group 4.

Ascalon Series

The Ascalon series consists of deep, sloping, well-drained soils on fans and foot slopes and in shallow drainageways in the sandstone uplands. Slopes range from 4 to 8 percent. These soils formed in alluvium. Elevation ranges from 3,000 to 3,800 feet.

The native vegetation is mainly blue grama, needleandthread, prairie sandreed, green sagewort, and eriogonum. Annual precipitation is 13 to 14 inches, the average annual soil temperature is 47° F, and the frost-free period is 110 to 115 days.

In a representative profile the surface layer is dark grayish-brown sandy loam about 7 inches thick. The subsoil is dark grayish-brown, grayish-brown, and brown sandy clay loam about 20 inches thick. The substratum is light yellowish-brown and pale-yellow sandy loam that extends to a depth of 65 inches or more.

Permeability is moderate, and available water capacity is moderate. The effective rooting depth is 60 inches or more. These soils are used for range, wildlife, recreation, watershed, dryfarmed crops, and pasture.

Representative profile of Ascalon sandy loam, 4 to 8 percent slopes, in a cultivated area, 1,650 feet north and 100 feet west of the SE. corner of sec. 21, T. 7 S., R. 35 E.

Ap—0 to 7 inches, dark grayish-brown (10YR 4/2) sandy loam, very dark grayish brown (10YR 2/2) moist; weak, subangular blocky structure parting to single grained; soft, friable, nonsticky and slightly plastic; common fine roots; abrupt, smooth boundary.

B21t—7 to 11 inches, dark grayish-brown (10YR 4/2) sandy clay loam, very dark grayish brown (10YR 3/2) moist; moderate, coarse, prismatic structure; hard, friable, slightly sticky and plastic; common very fine roots; common very fine pores; clay coating on sand grains; gradual, wavy boundary.

B22t—11 to 19 inches, grayish-brown (10YR 5/2) sandy clay loam, dark grayish brown (10YR 4/2) moist; moderate, medium, prismatic structure; hard, friable, slightly sticky and plastic; common very fine roots; common very fine pores; thin, patchy clay films in pores; gradual, wavy boundary.

B3—19 to 27 inches, brown (10YR 5/3) sandy clay loam, dark brown (10YR 4/3) moist; weak, medium, prismatic structure; hard, friable, nonsticky and slightly plastic; few fine roots and very fine pores; clear, wavy boundary.

C1—27 to 32 inches, light yellowish-brown (2.5Y 6/4) sandy loam, olive brown (2.5Y 4/4) moist; massive; friable, nonsticky and slightly plastic; few very fine pores; strongly effervescent; few very fine lime mottles; gradual, wavy boundary.

C2ca—32 to 53 inches, light yellowish-brown (2.5Y 6/4) sandy loam, light olive brown (2.5Y 5/4) moist; massive; hard, friable, nonsticky and slightly plastic; strongly effervescent; common fine lime mottles gradual, wavy boundary.

C3—53 to 65 inches, pale-yellow (2.5Y 7/4) sandy loam, light yellowish brown (2.5Y 6/4) moist; massive; slightly hard, friable, nonsticky and slightly plastic; strongly effervescent; few fine lime mottles; few sandstone fragments.

Depth to calcareous material ranges from 18 to 40 inches. The Ap horizon ranges from 7 to 10 inches in thickness, and the B2t horizon, from 6 to 20 inches. On north-facing slopes, the A horizon ranges from 8 to 14 inches in thickness. The B2t horizon ranges from 20 to 30 percent clay. The soil is 0 to 10 percent coarse fragments of sandstone throughout the profile.

Ascalon sandy loam, 4 to 8 percent slopes (Az).—This soil is on smooth foot slopes and at the heads of drainageways in narrow, shallow valleys of the sedimentary uplands. Areas range from 10 to 20 acres in size. Slopes are steepest on the foot slopes and the heads of drainageways.

Runoff is slow, and the hazard of erosion is moderate. This soil is used for dryfarmed crops, hay, wildlife, recreation, watershed, and range. Capability unit IIIe–2 dryland; Sandy range site, 10- to 14-inch precipitation zone; windbreak suitability group 2M.

Babb Series

The Babb series consists of deep, rolling to very steep, well-drained soils on hills and valley sides. Slopes range from 8 to 70 percent. These soils formed in gravelly and channery loam material derived from the underlying bedrock or in colluvium derived from limestone, shale, and siltstone bedrock. Elevation ranges from 4,500 to 7,000 feet.

The native vegetation is mainly a dense stand of Douglas-fir, spruce, and juniper and an understory of snowberry, ninebark, oregongrape, mountain maple, and thimbleberry. Annual precipitation is 18 to 24 inches, the average annual soil temperature is 42° to 44° F, and the frost-free period is 60 to 70 days.

In a representative profile the surface layer is a thin mat of decomposed evergreen needles and twigs over

a thin layer of dark grayish-brown silt loam. The subsoil is grayish-brown, light brownish-gray, and brown loam, clay loam, and channery loam about 24 inches thick. The substratum is white very channery loam that extends to a depth of 60 inches or more.

Permeability is moderate, and available water capacity is low or moderate. The effective rooting depth is 60 inches or more. These soils are used for woodland, watershed, recreation, range, and wildlife.

Representative profile of Babb silt loam, hilly, in woodland, 660 feet south and 400 feet east of the NW. corner sec. 34, T. 8 S., R. 31 E.

O1—1 inch to 0, loose mat of partly decomposed pine needles and twigs; abrupt, smooth boundary.

A—0 to 3 inches, dark grayish-brown (10YR 4/2) silt loam, very dark brown (10YR 2/2) moist; weak, medium, platy structure; slightly hard, sticky and plastic; common fine and medium roots; 5 percent (volume) 1- to 3-inch fragments of channer size; clear, smooth boundary.

B1—3 to 10 inches, grayish-brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; weak, medium, blocky structure; hard, friable, sticky and plastic; common fine and medium roots; 10 percent (volume) fragments of channer size; clear, wavy boundary.

B2—10 to 20 inches, brown (10YR 5/3) clay loam, dark brown (10YR 3/3) moist; moderate, fine, blocky structure; hard, friable, sticky and plastic; common fine and micro roots; 10 percent (volume) fragments of channer size; clear, wavy boundary.

B3—20 to 27 inches, light brownish-gray (10YR 6/2) channery loam, dark brown (10YR 4/3) moist; weak, medium, blocky structure; hard, friable, sticky and plastic; common very fine and micro roots; 20 percent (volume) fragments of channer size; strongly effervescent; thin lime coating on fragments; clear, wavy boundary.

Cca—27 to 60 inches, white (10YR 8/2) very channery loam, pale brown (10YR 6/3) moist; massive; hard, friable, sticky and plastic; few very fine and micro roots; 60 percent (volume) fragments of channer size; violently effervescent; flour lime throughout the mass.

Depth to bedrock ranges from 40 to more than 60 inches. Depth to lime is 16 to 24 inches. The soil ranges from 5 to 15 percent (volume) limestone and shale fragments of gravel and channer size to a depth of 20 inches, and from 30 to 60 percent between depths of 20 and 60 inches. The A horizon is grayish brown and brown. The B and C horizons are loam and clay loam. The B2 horizon ranges from 10 to 16 inches in thickness. The Cca horizon is light gray and very pale brown.

Babb silt loam, rolling (BA).—This rolling soil is on the upper parts of hillsides and ridges in the sedimentary highlands. Slopes are mostly 12 to 15 percent and range from 300 to 800 feet long. The soil has a profile similar to the one described as representative of the series, but the substratum is less than 30 percent coarse fragments, the soil contains less segregated lime, and red shale bedrock is at a depth of 40 to 60 inches. Included in mapping are some areas of Tarrete silty clay loam.

Runoff is rapid, and the hazard of erosion is moderate. This soil is used for timber production, range, pasture, recreation, watershed, and game range. The principal tree species on this soil are Douglas-fir, Engelmann spruce, and subalpine fir. A few quaking aspen grow along the shallow drainageways. The average site index for Douglas-fir is 60.

Timber harvest on this soil faces no major limitations or hazards. Access is from the ridgetops. Most areas benefit from cuttings that open the stands by removing merchantable trees. Slash burning is recommended only where timber harvest has left large concentrations. Minor infestations of bark beetles occur in the Big Horn Mountains. Capability unit IVe–2 dryland; not placed in a range site or windbreak suitability group.

Babb silt loam, hilly (BB).—This hilly soil is on the sides of mountain valleys, generally above thick limestone ledges that form the valley rim. Slopes are mostly 25 to 35 percent, but they range to 15 percent. The soil has the profile described as representative of the series.

Included with this soil in mapping are small areas of soils in which depth to red shale is 40 to 60 inches and some areas of Adel and Mayflower soils.

Runoff is rapid, and the hazard of erosion is severe. This soil is used for woodland, range, watershed, recreation, and game range. The principal tree species on this soil are Douglas-fir, Engelmann spruce, and subalpine fir. A few quaking aspen and mountain maple grow on the valley bottoms and lower hillsides. The average site index for Douglas-fir is 60.

Timber harvest on this soil faces no major limitations or hazards, but on the canyon sides erosion is severe on logging and access roads. Most areas benefit from cuttings that open the stands by removing the merchantable trees. Minor infestations of bark beetles occur in the Big Horn Mountains. Capability unit VIe–1 dryland; not placed in a range site or windbreak suitability.

Beauvais Series

The Beauvais series consists of deep, gently undulating to rolling, well-drained soils on high terraces and hills. Slopes range from 2 to 15 percent. These soils formed in a loess mantle of silty clay loam or silt loam derived from mixed rocks. Elevation ranges from 3,100 to 3,900 feet.

The native vegetation is prairie junegrass, broom snakeweed, western wheatgrass, big sagebrush, and Sandberg bluegrass. Annual precipitation is 15 to 17 inches, the average annual soil temperature is 48° to 50° F, and the frost-free period is 110 to 120 days.

In a representative profile the surface layer is grayish-brown silty clay loam about 5 inches thick. The subsoil is brown silty clay about 4 inches thick. The upper part of the substratum is light-gray silty clay loam, and the lower part is light brownish-gray silty clay loam that extends to a depth of 60 inches or more.

Permeability is moderately slow, and available water capacity is high above a depth of 60 inches. The effective rooting depth is 60 inches or more. These soils are used for dryfarmed and irrigated crops, watershed, wildlife, recreation, and range.

Representative profile of Beauvais silty clay loam, gently undulating, in grassland, 300 feet east and 1,320 feet south of the NW. corner sec. 2, T. 3 S., R. 34 E.

Ap—0 to 5 inches, grayish-brown (10YR 5/2) light silty clay loam, very dark grayish brown (10YR 3/2) moist; weak, coarse, granular structure; hard,

friable, sticky and plastic; abrupt, smooth boundary.

B2t—5 to 9 inches, brown (10YR 5/3) light silty clay, dark brown (10YR 3/3) moist; moderate, medium, prismatic structure parting to moderate, medium, blocky; hard, firm, sticky and plastic; many very fine and few fine tubular pores; distinct, continuous, dark grayish-brown (10YR 4/2), glossy coatings on peds; patchy clay films on peds, in pores, and bridging sand grains; clear wavy boundary.

C1ca—9 to 16 inches, light-gray (2.5Y 7/2) light silty clay loam, light olive brown (2.5Y 5/4) moist; weak, coarse, prismatic structure parting to weak, coarse and medium, blocky; hard, friable, sticky and plastic; many very fine tubular pores; strongly effervescent; few indistinct, fine lime masses; gradual, wavy boundary.

C2ca—16 to 30 inches, light brownish-gray (2.5Y 6/2) light silty clay loam, light olive brown (2.5Y 5/4) moist; weak, coarse, blocky structure; hard, friable, sticky and plastic; many very fine tubular pores; strongly effervescent; common coarse lime masses; gradual, wavy boundary.

C3—30 to 60 inches, light brownish-gray (2.5Y 6/2) heavy silty clay loam, grayish brown (2.5Y 5/2) moist; massive; hard, firm, sticky and plastic; strongly effervescent.

The noncalcareous Ap and B2t horizons range from 6 to 10 inches in combined thickness. In places the soil has 1/16- to 1/2-inch pebbles on the surface and throughout. The Ap horizon ranges from grayish brown to pale brown. The B2t horizon ranges from 35 to 50 percent clay and from brown to dark grayish brown. The Cca and C3 horizons range from light brownish-gray to light yellowish-brown silt loam or silty clay loam.

Beauvais silty clay loam, gently undulating (Bc).—This gently undulating soil is on high benches and terraces. Areas range from 40 to 250 acres in size. Slopes are 2 to 4 percent, and they range from 100 to 250 feet long. Drainageways are widely spaced and shallow. The soil has the profile described as representative of the series. Locally, the underlying gravel in places is only semirounded and is mainly sandstone. Included in mapping are areas of Sofia and Richfield soils.

Runoff is medium, and the hazard of erosion is slight. This soil is used for irrigated and dryfarmed crops, hay, wildlife, recreation, and range. Capability unit IIe–2 dryland, IIe–1 irrigated; Silty range site, 15- to 19-inch precipitation zone; windbreak suitability group 1.

Beauvais silty clay loam, undulating (Bd).—This undulating soil is on benches and high terraces. Areas range from 40 to 150 acres in size. Slopes are mostly 4 to 6 percent, but in places at the junctions of the deep drainageways, they are 7 and 8 percent. Slopes range from 75 to 175 feet long. The soil has a profile similar to the one described as representative of the series, but some fragments of pebble size from weathered conglomerate are on the surface. Included in mapping are small areas of Sofia soils.

Runoff is medium, and the hazard of erosion is moderate. This soil is used for irrigated and dryfarmed crops, hay, wildlife, recreation, watershed, and range. Capability unit IIIe–2 dryland, IIIe–1 irrigated; Silty range site, 15- to 19-inch precipitation zone; windbreak suitability group 1.

Beauvais silty clay loam, rolling (Be).—This rolling soil is on narrow foot slopes, knolls, hills, and high stream terraces. Slopes range from 8 to 10 percent on the foot slopes and are as much as 15 percent elsewhere. The soil has a profile similar to the one described as representative of the series, but it is steeper and there are a few coarse fragments of gravel size scattered on the surface.

Runoff is rapid, and the hazard of erosion is moderate. This soil is used for wildlife, recreation, watershed, range, hay and dryfarmed and irrigated crops. Capability unit IVe–2 dryland, IVe–2 irrigated; Silty range site, 15- to 19-inch precipitation zone; windbreak suitability group 1.

Beauvais-Gilt Edge silty clay loams, gently undulating (Bf).—This complex is made up of gently undulating soils on terraces. It is about 75 percent Beauvais silty clay loam and 25 percent Gilt Edge silty clay loam. Slopes are 2 to 4 percent. Drainageways are not well established and surface water collects on the flatter slopes and in swales. Short, uneven slopes predominate, and the Gilt Edge soil has the least gradient. The Gilt Edge soil in this complex has a profile similar to the one described as representative of the Gilt Edge series, but it has a horizon that contains gypsum crystals below a depth of 30 inches. Included in mapping are small spots of Colby soils.

Runoff is slow, and the hazard of erosion is slight. These soils are used for irrigated and dryfarmed crops, hay, wildlife, recreation, and range. Capability unit IIe–2 dryland, IIe–1 irrigated; Clayey range site, 15- to 19-inch precipitation zone; windbreak suitability group 2S.

Belfield Series

The Belfield series consists of deep, nearly level and gently undulating, and undulating, well-drained soils on fans, terraces, foot slopes, and loess-mantled ridges and hills. Slopes range from 0 to 8 percent. These soils formed in moderately alkaline alluvium and eolian deposits. Elevation ranges from 3,400 to 4,500 feet.

The native vegetation is mainly western wheatgrass, silver sage, green needlegrass, and blue grama. Annual precipitation is 14 to 17 inches, the average annual soil temperature is 45° to 47° F, and the frost-free period is 105 to 115 days.

In a representative profile the surface layer is light brownish-gray silt loam about 3 inches thick. The next layer is light brownish-gray silt loam about 2 inches thick. The subsoil, about 22 inches thick, is grayish-brown, brown, and light yellowish-brown silty clay loam and silty clay. The substratum is light yellowish-brown and pale-yellow silty clay loam that extends to a depth of 60 inches or more.

Permeability is moderately slow in the subsoil, and available water capacity is high in the upper 60 inches. The effective rooting depth is 60 inches or more. These soils are used for range, wildlife, recreation, watershed, and irrigated and dryfarmed crops.

Representative profile of Belfield silt loam, gently undulating, in grassland, 300 feet south and 15 feet west of the NE. corner sec. 25, T. 1 N., R. 38 E.

A2—0 to 3 inches, light brownish-gray (10YR 5/1) silt loam, very dark grayish brown (10YR 3/2) moist; moderate, thin, platy structure; slightly hard, friable, nonsticky and nonplastic; common fine and very fine roots; common clean sand grains; clear boundary.

A&B—3 to 5 inches, light brownish-gray (10YR 5/1) silt loam, very dark grayish brown (10YR 3/2) moist; moderate, medium, platy structure; hard, friable, slightly sticky and slightly plastic; common very fine roots; common clean sand grains; gradual boundary.

B&A—5 to 10 inches, grayish-brown (10YR 5/2) silty clay loam, very dark grayish brown (10YR 3/2 rubbed, 2/2 coats) moist; weak, fine, prismatic structure parting to moderate, medium, platy; hard, friable, sticky and plastic; common fine and medium pores; thin, continuous and thick, platy clay films on peds; clear boundary.

B2t—10 to 22 inches, brown (10YR 5/3 rubbed, 5/2 coats) silty clay, olive brown (10YR 4/3) moist; strong, medium, prismatic structure parting to moderate, medium and fine, blocky; very hard, firm, sticky and very plastic; common fine pores; moderately thick, patchy clay films on peds and in some fine pores; gradual boundary.

B3—22 to 27 inches, light yellowish-brown (2.5Y 6/4) silty clay loam, olive brown (2.5Y 4/4) moist; moderate, medium, prismatic structure parting to moderate, medium, blocky; very hard, firm, sticky and plastic; common fine pores; thin, patchy clay films on peds; moderately effervescent; few fine lime threads; clear, wavy boundary.

C1ca—27 to 32 inches, light yellowish-brown (2.5Y 6/4) silty clay loam, olive brown (2.5Y 4/4) moist; weak, medium, blocky structure; very hard, friable, sticky and plastic; strongly effervescent; common lime threads and a few lime mottles that have a diffuse boundary; gradual, wavy boundary.

C2—32 to 60 inches, pale-yellow (2.5Y 7/4) silty clay loam, light olive brown (2.5Y 5/4) moist; massive; hard, friable, sticky and plastic; strongly effervescent.

Depth to calcareous material ranges from 16 to 26 inches. The A2 and A&B horizons range from 4 to 8 inches in combined thickness. The B2t horizon ranges from 35 to 45 percent clay.

Belfield silt loam, 0 to 1 percent slopes (Bg).—This soil is on terraces and fans. Areas are irregular in shape and range to as much as 20 acres in size. Slopes are mostly less than 1 percent. The soil has a profile similar to the one described as representative of the series, but it is less sloping. Included in mapping are small spots of Adger clay.

Runoff is slow, and the hazard of erosion is slight. This soil is used for dryfarmed and irrigated crops, hay, wildlife, recreation, and range. Capability unit IIs–2 dryland, IIs–1 irrigated; Silty range site, 15- to 19-inch precipitation zone; windbreak suitability group 1.

Belfield silt loam, gently undulating (Bh).—This gently undulating soil is on small fans and foot slopes. Slopes are mostly 2 to 4 percent, but they range to 1 percent. Slopes range from 150 to 300 feet long. The soil has the profile described as representative of the series. Included in mapping are narrow bands of Shaak and Savage soils.

Runoff is slow, and the hazard of erosion is slight to moderate. The soils on the foot slopes receive runoff from the soils above. This soil is used for irrigated and dryfarmed crops, hay, wildlife, recreation, and range. Capability unit IIe–2 dryland, IIe–1 irrigated; Silty range site, 15- to 19-inch precipitation zone; windbreak suitability group 1.

Belfield silt loam, undulating (Bk).—This undulating soil is on foot slopes and at the heads of drainageways. Areas range from 10 to 15 acres in size. The soil has a profile similar to the one described as representative of the series, but it is steeper, and in small areas the subsurface layer has been eroded away. Included in mapping are small areas of Savage silty clay loam.

Runoff is medium, and the hazard of erosion is moderate. This soil is used for irrigated and dryfarmed crops, hay, watershed, wildlife, recreation, and range. Capability unit IIIe–2 dryland, IIIe–1 irrigated; Silty range site, 15- to 19-inch precipitation zone; windbreak suitability group 1.

Belfield-Adger complex, 0 to 1 percent slopes (Bm).—This complex is made up of nearly level soils on terraces and benches. It is about 75 percent Belfield silt loam and 25 percent Adger silty clay. Areas range from 10 to 15 acres in size. The Adger soil is in microdepressions that are 5 to 15 feet wide and 3 to 5 inches deep. The Belfield soil in this complex has a profile similar to the one described as representative of the Belfield series, but in places wind-laid deposits have thickened the surface layer to 4 or 5 inches.

Runoff is slow, and the hazard of erosion is slight. These soils are used for wildlife, recreation, range, hay, and dryfarmed crops. Capability unit IIe–2 dryland; Pan Spots range site, 15- to 19-inch precipitation zone; windbreak suitability group 3S.

Belfield-Adger complex, gently undulating (Bn).—This complex is made up of gently undulating soils on fans, terraces, and foot slopes. It is about 80 percent Belfield silt loam and 20 percent Adger silty clay. Slopes range from 1 to 4 percent. The Adger soil is in shallow microdepressions and has slopes of 1 and 2 percent.

Runoff is slow, and the hazard of erosion is slight. These soils are used for wildlife, recreation, range, hay, and dryfarmed crops. Capability unit IIe–2 dryland; Pan Spots range site, 15- to 19-inch precipitation zone; windbreak suitability group 3S.

Belfield-Adger complex, undulating (Bo).—This complex is made up of undulating soils on fans, terraces, and foot slopes. It is 50 to 70 percent Belfield silt loam, 20 to 30 percent Adger silty clay, and 5 to 15 percent Nobe clay. The Belfield, Nobe, and Adger soils occupy the areas between the channels. Slopes range from 2 to 15 percent but are mostly 4 to 8 percent. Included in mapping are some areas of Wayden and Savage soils.

Runoff is medium, and the hazard of erosion is moderate. These soils are used for wildlife, recreation, watershed, range, hay, and dryfarmed crops. Capability unit IIIe–2 dryland; Pan Spots range site, 15- to 19-inch precipitation zone; windbreak suitability group 3S.

Benteen Series

The Benteen series consists of moderately deep, rolling and hilly, well-drained soils on broad ridges and hills in the sedimentary highlands in the highest part of the Big Horn Mountains. Slopes range from 8 to 35 percent. These soils formed in place in crystalline limestone. Elevation ranges from 7,000 to 8,500 feet.

The native vegetation is Idaho fescue, sedges, lupine, wild geranium, rough fescue, mountain bromegrass, mountain timothy, and scattered fir trees. Annual precipitation is 20 to 24 inches, the average annual soil

temperature is 40° to 44° F, and the frost-free period is 55 to 65 days.

In a representative profile the surface layer is dark-brown loam about 4 inches thick. The subsoil is brown and pale-brown clay loam and loam about 18 inches thick. The substratum is pale-brown channery loam that is about 25 percent flat fragments of limestone. Limestone is at a depth of about 29 inches.

Permeability is moderate, and available water capacity is low. The effective rooting depth is about 30 inches. These soils are used for grazing, summer game range, watershed, and recreation.

Representative profile of Benteen loam, rolling, in grassland, 1,320 feet west and 300 feet north of the SW. corner sec. 25, T. 9 S., R. 31 E.

A11—0 to 2 inches, dark-brown (10YR 4/3) loam, very dark brown (10YR 2/3) moist; weak, very thin, platy structure; soft, very friable, slightly sticky and plastic; many very fine roots; clear, smooth boundary.

A12—2 to 4 inches, dark-brown (10YR 4/3) heavy loam, dark brown (10YR 3/3) moist; weak, coarse, prismatic structure; hard, friable, sticky and plastic; many very fine roots; common very fine pores; clear, wavy boundary.

B21t—4 to 10 inches, brown (10YR 5/3) light clay loam, dark brown (10YR 3/3) moist; moderate, medium and coarse, prismatic structure; hard, friable, sticky and plastic; common very fine roots; common very fine pores; few thin, patchy clay films on peds; gradual, wavy boundary.

B22t—10 to 17 inches, brown (10YR 5/3) clay loam, dark brown (10YR 3/5) moist; moderate, medium and coarse, prismatic structure; hard, friable, sticky and plastic; common very fine roots; common very fine pores; few thin, patchy clay films on peds; clear, wavy boundary.

B3—17 to 22 inches, pale-brown (10YR 6/3) heavy loam, brown (10YR 5/3) moist; weak, medium, blocky structure; hard, friable, sticky and plastic; common very fine roots; common very fine pores; 15 percent (volume) limestone fragments; clear, wavy boundary.

C—22 to 29 inches, pale-brown (10YR 6/3) channery heavy loam, brown (10YR 5/3) moist; massive; slightly hard, friable, sticky and plastic; 25 percent (volume) limestone fragments; slightly effervescent in spots; clear, irregular boundary.

R—29 inches, limestone.

Depth to bedrock ranges from 20 to 40 inches. The A1 horizon is less than 10 percent (volume) coarse limestone fragments. The B2t horizon is 5 to 25 percent fragments of gravel, cobble, and channer size, and the C horizon, 20 to 30 percent. The A horizon is brown or grayish brown. The B2t horizon is light yellowish-brown and pale-brown clay loam or silty clay loam.

Benteen loam, rolling (Bp).—This rolling soil is on hills and broad ridges in the sedimentary uplands. Areas range from 40 to 150 acres in size. Slopes are 8 to 15 percent. The soil has the profile described as representative of the series.

Included with this soil in mapping are small areas of Duncom soils that are marked by Rock outcrop and limestone channers that cover 20 to 35 percent of the soil surface. Also included are discontinuous, low rock ledges on valley sides.

Runoff is rapid, and the hazard of erosion is severe. This soil is used for range, wildlife, watershed, and recreation. Capability unit VIe–1 dryland; Silty range site, 20- to 24-inch precipitation zone; windbreak suitability group 1.

Benteen loam, hilly (Br).—This hilly and steep soil is on hills and ridges in the sedimentary highlands. Areas range from 30 to 250 acres in size. Slopes are mostly 20 to 35 percent, and they range from 300 to 1,000 feet long. The soil has a profile similar to the one described as representative of the series, but it is steeper and the lower part of the substratum is 35 to 45 percent coarse fragments of limestone.

Included with this soil in mapping are some areas of Hanson gravelly loam, Duncom channery loam, and rock ledges that are 3 to 5 feet high. The Hanson soil is on valley sides below the rock ledges.

Runoff is rapid, and the hazard of erosion is severe. This soil is used for range, wildlife, watershed, and recreation. Capability unit VIe–1 dryland; Silty range site, 20- to 24-inch precipitation zone; windbreak suitability group 1.

Bew Series

The Bew series consists of deep, nearly level and gently undulating, well-drained soils on wide river terraces and fans. Slopes range from 0 to 4 percent. These soils formed in alluvium. Elevation ranges from 2,900 to 3,300 feet.

The native vegetation is mainly western wheatgrass, green needlegrass, big sagebrush, and blue grama. Annual precipitation is 12 to 13 inches, the average annual soil temperature is 48° to 49° F, and the frost-free period is 115 to 125 days.

In a representative profile the surface layer is grayish-brown silty clay loam about 7 inches thick. The subsoil is grayish-brown and light olive-brown clay about 9 inches thick. The substratum is light olive-brown and olive-gray clay that extends to a depth of 62 inches or more.

Permeability is slow, and available water capacity is moderate or high to a depth of 60 inches. The effective rooting depth is 60 inches or more. These soils are used for range, wildlife, recreation, and irrigated and dryfarmed crops.

Representative profile of Bew silty clay loam, 0 to 1 percent slopes, in a plowed field, 1,320 feet south and 1,320 feet west of the NE. corner sec. 31, T. 1 N., R. 33 E.

Ap—0 to 7 inches, grayish-brown (2.5Y 5/2) light silty clay loam, dark grayish brown (2.5Y 4/2) moist; strong, very fine, granular structure; hard, firm, sticky and plastic; few very fine roots; clear, smooth boundary.

B2t—7 to 11 inches, grayish-brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; moderate, medium, blocky structure; very hard, firm, very sticky and very plastic; few very fine roots; common very fine pores; thin, patchy clay films on peds; clear, smooth boundary.

B3—11 to 16 inches, light olive-brown (2.5Y 5/4) clay, olive brown (2.5Y 4/4) moist; moderate, medium and fine, blocky structure; very hard, very firm, very sticky and very plastic; few very fine roots; common very fine pores; slightly effervescent; gradual, wavy boundary.

C1ca—16 to 28 inches, light olive-brown (2.5Y 5/4) clay, olive brown (2.5Y 4/4) moist; strong, medium and fine, blocky structure; very hard, very firm, very sticky and very plastic; few very fine roots; common very fine pores; strongly effervescent; com-

mon fine, soft, irregular lime masses; gradual, wavy boundary.

C2—28 to 41 inches, olive-gray (5Y 5/2) clay, olive gray (5Y 4/2) moist; moderate, coarse, blocky structure; very hard, very firm, very sticky and very plastic; common very fine pores; strongly effervescent; few fine, soft lime masses; clear, wavy boundary.

IICcs—41 to 62 inches, olive-gray (5Y 5/2) clay, olive gray (5Y 4/2) moist; massive; very hard, very firm, very sticky and very plastic; few fine pores; strongly effervescent; common fine gypsum crystals.

Depth to lime ranges from 10 to 16 inches. The undisturbed soil has an A1 horizon of silty clay loam or clay loam that ranges from 1 inch to 3 inches in thickness. The B2t horizon is olive, olive gray, grayish brown, and olive brown. It is 48 to 60 percent clay. The C horizon is olive and light yellowish brown.

Bew silty clay loam, 0 to 1 percent slopes (Bs).—This nearly level soil is on high terraces, benches, and fans. Slopes range from 100 to 400 feet long. The soil has the profile described as representative of the series. Included in mapping are spots of Shonkin soils in shallow depressions.

Runoff is slow, and the hazard of erosion is slight. This soil is used for irrigated and dryfarmed crops, hay, wildlife, recreation, and range. Capability unit IIIs–3 dryland, IIIs–1 irrigated; Clayey range site, 10- to 14-inch precipitation zone; windbreak suitability group 1.

Bew silty clay loam, gently undulating (Bt).—This gently undulating soil is on terraces and fans. Slopes are mostly 2 to 4 percent, but they range to 1 percent. The soil has a profile similar to the one described as representative of the series, but it is steeper. Included in mapping are ½- to 1-acre areas on Shonkin soils.

Runoff is slow, and the hazard of erosion is slight to moderate. This soil is used for irrigated and dryfarmed crops, hay, wildlife, recreation, and range. Capability unit IIIe–3 dryland, IIIe–1 irrigated; Clayey range site, 10- to 14-inch precipitation zone; windbreak suitability group 1.

Bitton Series

The Bitton series consists of deep, gently sloping and sloping and hilly, excessively drained soils on dissected remnants of fans and terraces. Slopes range from 2 to 35 percent. These soils formed in gravelly loam alluvium. Elevation ranges from 3,300 to 3,800 feet.

The native vegetation is needleandthread, little bluestem, bluebunch wheatgrass, side-oats grama, broom snakeweed, and phlox. Annual precipitation is 14 to 15 inches, the average annual soil temperature is 46° to 47° F, and the frost-free period is 105 to 120 days.

In a representative profile the surface layer is grayish-brown gravelly loam about 11 inches thick. The underlying material is grayish-brown and pale-brown gravelly and very gravelly loam that extends to a depth of 64 inches or more.

Permeability is rapid, and available water capacity is low. The effective rooting depth is 60 inches or more. These soils are used for range, wildlife, recreation, and watershed. They are a source of road fill and gravel.

Representative profile of Bitton gravelly loam, in an area of Bitton soils, hilly, in grassland, on the west side of ridge approximately 2,300 feet south and 1,000 feet east of the NW. corner sec. 34, T. 4 S., R. 36 E.

A11—0 to 4 inches, grayish-brown (10YR 4/2) gravelly loam, dark brown (10YR 3/3) moist; weak, fine, granular structure; soft, very friable, nonsticky and nonplastic; many very fine roots; 15 percent (volume) rounded and semirounded sandstone and shale fragments of gravel size; slightly effervescent; abrupt, smooth boundary.

A12—4 to 11 inches, grayish-brown (10YR 5/2) gravelly loam, dark brown (10YR 3/3) moist; weak, medium, blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; 20 percent (volume) sandstone and shale fragments of gravel size; slightly effervescent; gradual, wavy boundary.

C1—11 to 21 inches, grayish-brown (10YR 5/2) gravelly loam, dark brown (10YR 4/3) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots; 35 percent (volume) sandstone and shale fragments of gravel size; strongly effervescent; clear, wavy boundary.

C2ca—21 to 46 inches, pale-brown (10YR 6/3) very gravelly loam, brown (10YR 5/3) moist; weak, fine, subangular blocky structure; soft, friable sticky and plastic; common very fine roots; strongly effervescent; 65 percent (volume) sandstone and shale fragments of gravel size; lime coatings on the bottoms of the fragments; gradual, wavy boundary.

C3—46 to 64 inches, pale-brown (10YR 6/3), stratified gravelly loam and gravelly sandy loam, yellowish brown (10YR 5/4) moist; massive; slightly hard, friable, nonsticky and slightly plastic; few very fine roots; 45 percent (volume) sandstone and shale fragments of gravel size; strongly effervescent.

The soil ranges from 10 to 20 percent (volume) coarse fragments of semirounded sandstone and burned shale in the upper 11 inches, and from 35 to 65 percent in the underlying layers. The A horizon is dark brown and dark grayish brown. The C horizon ranges from light brownish gray to light brown.

Bitton gravelly loam, 2 to 8 percent slopes (BU).—This gently sloping and sloping soil is on dissected, gravelly, mantled shale ridges, benches, and terraces. Slopes are mostly 7 to 8 percent on the ridges and 2 to 3 percent on the terraces. The soil has a profile similar to the one described as representative of the series, but it is reddish brown, and its coarse fragments are mostly quartzite and limestone. Included in mapping are some areas of Peritsa soils at the heads of shallow drainageways.

Runoff is medium, and the hazard of erosion is moderate. This soil is used for dryfarmed crops, hay, watershed, wildlife, recreation, and range. Capability unit IVs–2 dryland; Silty range site, 15- to 19-inch precipitation zone; windbreak suitability group 3M.

Bitton soils, hilly (BV).—This complex is made up of hilly loam and gravelly loam soils on deeply dissected gravelly and loess-mantled benches and terraces. Slopes are mostly 15 to 25 percent, but they range to 35 percent. In places, erosion has reduced the original terraces to a few isolated ridges and hills. Slopes are 100 to 250 feet long. The Bitton gravelly loam in this complex has the profile described as representative of the series.

Included with these soils in mapping are some areas of Xavier soils on the wider ridges. Also included are areas of Doney and Wayden soils on lower valley sides.

Runoff is rapid, and the hazard of erosion is severe. These soils are used for range, wildlife, recreation, and watershed. They are a source of road gravel. Capability unit VIe–1 dryland; Thin Hilly range site, 15- to 19-inch precipitation zone; windbreak suitability group 4.

Bone Series

The Bone series consists of well-drained, deep, nearly level and gently sloping, sodium-affected soils on broad river terraces, fans, and valley bottoms. Slopes range from 0 to 4 percent. These soils formed in clay alluvium. Elevation ranges from 2,700 to 3,800 feet.

The native vegetation is a sparse stand of salt- and alkali-tolerant forbs, greasewood, alkali sacaton, inland saltgrass, and western wheatgrass. Annual precipitation is 12 to 14 inches, the average annual soil temperature is 47° to 49° F, and the frost-free period is 115 to 125 days.

In a representative profile the surface layer is grayish-brown silty clay about 2 inches thick. The underlying material is grayish-brown, light olive-brown, and pale-olive clay and silty clay that extends to a depth of 62 inches or more.

Permeability is very slow, and available water capacity is moderate or high. The effective rooting depth is 60 inches or more. These soils are used for range, wildlife, recreation, and irrigated pasture and hay.

Representative profile of Bone clay in grassland, 1,320 feet south and 850 feet east of the NW. corner sec. 36, T. 1 N., R. 34 E.

A1—0 to 2 inches, grayish-brown (2.5Y 5/2) silty clay, olive brown (2.5Y 4/4) moist; moderate, fine, granular structure; hard, firm, very sticky and very plastic; few fine roots; upper ½ inch is a light-gray, massive crust that has many vesicular pores; clear, smooth boundary.

C1—2 to 7 inches, grayish-brown (2.5Y 5/2) clay, olive brown (2.5Y 4/4) moist; moderate, very fine, blocky structure; very hard, firm, very sticky and very plastic; many very fine roots; common very fine pores; slightly effervescent; clear, smooth boundary.

C2cs—7 to 16 inches, light olive-brown (2.5Y 5/4) clay, olive brown (2.5Y 4/4) moist; strong, fine and medium, granular structure; slightly hard, friable, very sticky and very plastic; few very fine roots; strongly effervescent; many fine crystals of gypsum and other salts; gradual, wavy boundary.

C3cs—16 to 37 inches, light olive-brown (2.5Y 5/4) heavy silty clay, olive brown (2.5Y 4/4) moist; massive; very hard, firm, very sticky and very plastic; few very fine pores; strongly effervescent; common fine crystals of gypsum and other salts; gradual, wavy boundary.

C4cs—37 to 62 inches, pale-olive (5Y 6/3) clay, olive (5Y 4/3) moist; massive; very hard, very firm, very sticky and very plastic; strongly effervescent; many fine crystals of gypsum and other salts.

Depth to calcareous material ranges from 1 inch to 6 inches. The strongly saline layer ranges from 6 to 10 inches in thickness. The A horizon is light brownish gray, grayish brown, and light olive brown. The C horizon is 45 to 60 percent clay. The soil is grayish brown, light olive brown, olive brown, pale olive, and light yellowish brown. It ranges from 2 to 3 percent concentrations of soluble salt throughout the C horizon.

Bone clay (Bw).—This nearly level and gently sloping soil is on narrow terraces and fans along stream bottoms in the sedimentary uplands. Slopes are mostly 2 percent, but they range to 3 and 4 percent on fans and along drainageways on the terraces. The soil has the profile described as representative of the series.

Included with this soil in mapping are some spots of Talag clay. Also included are soils that have a granular saline layer at a depth of less than 20 inches and a water table at a depth of 3 feet or less.

Runoff is slow, and the hazard of erosion is slight. This soil is used for range, wildlife, and recreation. Capability unit VIIs–1 dryland; Dense Clay range site, 10- to 14-inch precipitation zone; windbreak suitability group 4.

Castner Series

The Castner series consists of shallow, undulating to hilly and steep, well-drained soils on hills and ridges in the sandstone uplands. Slopes are mostly 4 to 35 percent, but they range to 2 percent. These soils formed in place from calcareous sandstone. Elevation ranges from 3,700 to 5,000 feet.

The native vegetation is mainly bluebunch wheatgrass, dryland sedges, Sandberg bluegrass, and western wheatgrass. Annual precipitation is 15 to 18 inches, the average annual soil temperature is 44° to 45° F, and the frost-free period is 90 to 110 days.

In a representative profile the surface layer is dark grayish-brown sandy loam about 3 inches thick. The subsoil is dark-brown sandy loam about 7 inches thick. The substratum is brown sandy loam. Hard sandy shale is at a depth of about 12 inches.

Permeability is moderate, and available water capacity is very low. The effective rooting depth is 10 to 20 inches. Most of these soils are used for range, wildlife, recreation, and watershed. A few small areas are included with deeper soils and are used for dry-farmed crops.

Representative profile of Castner sandy loam in an area of Castner-Rock outcrop complex, rolling, in grassland, 1,300 feet south and 700 feet east of the NW. corner sec. 34, T. 4 S., R. 25 E.

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

B2—3 to 10 inches, dark-brown (10YR 4/3) heavy sandy loam, dark brown (10YR 3/3) moist; weak, medium, prismatic structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots; strongly effervescent; wavy boundary.

C—10 to 12 inches, brown (10YR 5/3) heavy sandy loam, dark brown (10YR 4/3) moist; massive; slightly hard, friable, slightly sticky and plastic; few very fine roots; strongly effervescent; abrupt, wavy boundary.

R—12 to 14 inches, hard sandy shale.

Depth to bedrock ranges from 6 to 20 inches. The soil ranges from 12 to 18 percent clay and from 5 to 35 percent (volume) coarse sandstone fragments. The A and B horizons are dark grayish-brown, dark-brown, and brown sandy loam and loam. The C horizon is brown, light olive brown, pale brown, or light yellowish brown.

Castner soils in the Big Horn County Area contain fewer coarse fragments than typical for the series, but this difference does not alter the use or behavior of the soils.

Castner-Reeder loams, undulating (CA).—This complex is made up of undulating soils in the sedimentary uplands. It is about 55 percent Castner loam, 40 percent Reeder loam, and 5 percent Rock outcrop. Slopes are 4 to 8 percent. Neither soil occupies any predictable place on the landscape, but the Castner soil is marked by surface channers. Rock outcrop is nearly level with the surrounding soil surface. The soils in this complex have profiles similar to the ones described as representative of their respective series, but they are less steep.

Runoff is medium, and the hazard of erosion is moderate. These soils are used for range, wildlife, recreation, and watershed. Capability unit VIe–1 dryland; Shallow range site, 15- to 19-inch precipitation zone; windbreak suitability group 3M.

Castner-Reeder loams, rolling (CB).—This complex is made up of rolling soils in the sedimentary uplands. It is about 60 percent Castner loam, 35 percent Reeder loam, and 10 percent Rock outcrop. Slopes are 8 to 15 percent. Neither soil occupies any predictable place on the landscape, but the Castner soil has surface channers. Rock outcrop is nearly level with the surrounding soil surface.

Runoff is medium, and the hazard of erosion is severe. These soils are used for range, wildlife, recreation, and watershed. Capability unit VIe–1 dryland; Shallow range site, 15- to 19-inch precipitation zone; windbreak suitability group 3M.

Castner-Rock outcrop complex, rolling (CC).—This complex is made up of rolling soils in the sedimentary uplands. It is about 50 percent Castner sandy loam, 35 percent Rock outcrop, and 15 percent Absarokee and Amherst soils. Slopes are 8 to 15 percent. The Castner soil is between drainageways. Rock outcrop is scattered in areas of the Castner soil or is a low ledge at the edges of deep drainageways. The Absarokee and Amherst soils are in concave areas on the land surface or at the lower ends of long, north-facing slopes. The Castner soil in this complex has the profile described as representative of the Castner series.

Runoff is medium, and the hazard of erosion is severe. These soils are used for range, wildlife, recreation, and watershed. Capability unit VIe–1 dryland; Shallow range site, 15- to 19-inch precipitation zone; windbreak suitability group 4.

Castner-Vebar sandy loams, hilly (CD).—This complex is made up of hilly and steep soils in the sedimentary uplands. It is about 50 percent Castner sandy loam, 40 percent Vebar sandy loam, and 10 percent Rock outcrop. Slopes are mostly 15 to 25 percent, but they range to as much as 35 percent. The Castner soil is mainly above or around areas of Rock outcrop. The Vebar soil is on the smoother ridgetops, hillsides, and the upper sides of valleys.

Runoff is medium, and the hazard of erosion is severe. These soils are used for range, recreation, watershed, and game range. Capability unit VIe–1 dryland; Sandy range site, 15- to 19-inch precipitation zone; windbreak suitability group 4

Cherry Series

The Cherry series consists of deep, gently sloping and sloping, well-drained soils on smooth fans, foot slopes, and terraces. Slopes range from 2 to 8 percent. These soils formed in alluvium washed from mixed shale beds. Elevation ranges from 3,500 to 4,500 feet.

The native vegetation is mainly western wheatgrass, silver sage, green needlegrass, scurf-pea, Hoods phlox, broom snakeweed, and prairie junegrass. Annual precipitation is 14 to 16 inches, the average annual soil temperature is 45° to 47° F, and the frost-free period is 105 to 115 days.

In a representative profile the surface layer is light olive-brown silty clay loam about 2 inches thick. The subsoil is grayish-brown silty clay loam about 6 inches thick. The substratum is light brownish-gray and light yellowish-brown silty clay loam that extends to a depth of 60 inches or more.

Permeability is moderately slow, and available water capacity is high. The effective rooting depth is 60 inches or more. These soils are used for range, wildlife, recreation, watershed, and dryfarmed and irrigated crops.

Representative profile of Cherry silty clay loam, 2 to 8 percent slopes, in grassland, 925 feet west and 350 feet north of the SE. corner sec. 17, T. 5 S., R. 29 E.

A1—0 to 2 inches, light olive-brown (2.5Y 5/4) light silty clay loam, olive brown (2.5Y 4/4) moist; moderate, thin, platy structure; hard, friable, slightly sticky and plastic; common very fine roots; slightly effervescent; clear, smooth boundary.

B2—2 to 8 inches, grayish-brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate, medium, prismatic structure parting to moderate, very fine, blocky; very hard, firm, sticky and plastic; common very fine roots; slightly effervescent; gradual, wavy boundary.

C1ca—8 to 12 inches, light brownish-gray (2.5Y 5/2) heavy silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate, medium, blocky structure; very hard, firm, very sticky and plastic; common very fine roots; common very fine pores; strongly effervescent; few fine, soft lime masses; diffuse, wavy boundary.

C2ca—12 to 19 inches, light brownish-gray (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate, fine, blocky structure; very hard, firm, very sticky and plastic; common very fine roots; common very fine pores; strongly effervescent; common medium and coarse, white, soft lime masses; diffuse, wavy boundary.

C3ca—19 to 34 inches, light yellowish-brown (2.5Y 6/4) heavy silty clay loam, light olive brown (2.5Y 5/4) moist; moderate, medium, blocky structure; very hard, firm, very sticky and very plastic; few very fine roots; common very fine pores; strongly effervescent; common medium and fine, soft lime masses; gradual, wavy boundary.

C4—34 to 60 inches, light yellowish-brown (2.5Y 6/4) heavy silty clay loam, light olive brown (2.5Y 5/4) moist; massive; very hard, firm, very sticky and very plastic; few very fine roots; common very fine pores; few medium and coarse, light yellowish-brown mottles; slightly effervescent.

The A1 and B2 horizons range from 7 to 14 inches in combined thickness. The soil ranges from 25 to 35 percent clay between depths of 10 and 40 inches. The A1 and B2 horizons are light olive brown, light brownish gray, grayish brown, and olive gray. The Cca horizon is light olive gray, pale olive, and light brownish gray.

Cherry silty clay loam, 2 to 8 percent slopes (Ce).—This gently sloping and sloping soil is on fans and foot

slopes. Slopes are 2 to 5 percent on the fans and 6 to 8 percent on the foot slopes. They range from 200 to 400 feet long.

Runoff is medium, and the hazard of erosion is moderate. Most areas receive runoff from residual soils that lie above them. This soil is used for range, recreation, wildlife, watershed, dryfarmed crops, hay, and irrigated crops. Capability unit IIIe–2 dryland, IIIe–1 irrigated; Clayey range site, 15- to 19-inch precipitation zone; windbreak suitability group 1.

Chugter Series

The Chugter series consists of deep, gently sloping to strongly sloping, well-drained soils on fans, foot slopes, and terraces. Slopes range from 2 to 15 percent. These soils formed in loam and gravelly loam alluvium derived from mixed calcareous sedimentary rocks. Elevation ranges from 3,400 to 4,000 feet.

The native vegetation is western wheatgrass, sideoats grama, needleandthread, prairie junegrass, big sagebrush, and cheatgrass. Annual precipitation is 11 to 13 inches, the average annual soil temperature is 47° to 48° F, and the frost-free period is 115 to 125 days.

In a representative profile the surface layer is reddish-brown loam about 6 inches thick. The subsoil is reddish-brown loam about 23 inches thick. The substratum is light reddish-brown loam that extends to a depth of 63 inches or more.

Permeability is moderate, and available water capacity is high. The effective rooting depth is 60 inches or more. These soils are used for range, wildlife, recreation, watershed, and dryfarmed crops.

Representative profile of Chugter loam, 2 to 8 percent slopes, in grassland, 100 feet west and 900 feet north of the SE. corner sec. 10, T. 9 S., R. 40 E.

Ap—0 to 6 inches, reddish-brown (5YR 5/3) loam, dark reddish brown (5YR 3/3) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots; many very fine interstitial pores and few fine tubular pores; abrupt, smooth boundary.

B2—6 to 10 inches, reddish-brown (5YR 4/3) heavy loam, dark reddish brown (5YR 3/3) moist; moderate, coarse, prismatic structure; hard, friable, slightly sticky and slightly plastic; common very fine roots; many very fine and few fine tubular pores; thin clay bridges between sand grains; clear, wavy boundary.

B3—10 to 16 inches, reddish-brown (5YR 4/3) loam, dark reddish brown (5YR 3/4) moist; weak, coarse, prismatic structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots; common very fine pores; few fine, reddish-brown shale and sandstone fragments; slightly effervescent; gradual, wavy boundary.

B3ca—16 to 29 inches, reddish-brown (5YR 5/3) loam, reddish brown (5YR 4/4) moist; weak, coarse, blocky structure; hard, friable, slightly sticky and slightly plastic; common very fine roots; common very fine pores; few fine shale and sandstone fragments; strongly effervescent; few very fine lime threads; gradual, wavy boundary.

C1ca—29 to 41 inches, light reddish-brown (5YR 6/3) loam, reddish brown (5YR 5/4) moist; massive; hard, friable, nonsticky and slightly plastic; strongly effervescent; common segregated lime threads; gradual, wavy boundary.

C2—41 to 63 inches, light reddish-brown (5YR 6/3) loam, reddish brown (5YR 5/4) moist; massive; slightly hard, friable, nonsticky and slightly plastic; strongly calcareous.

The soil between depths of 10 and 40 inches is loam or clay loam. The Ap horizon ranges from 3 to 6 inches in thickness and is reddish brown, reddish gray, and dark reddish gray. The B2 horizon is reddish brown, red, and yellowish red. The C horizon is light reddish brown, reddish yellow, and red.

Chugter loam, 2 to 8 percent slopes (Cf).—This nearly level and gently sloping soil is on foot slopes and fans in red, burned shale uplands. Areas range from 15 to 25 acres in size. The soil has the profile described as representative of the series. Included in mapping are areas of soils that have a surface layer of sandy loam.

Runoff is medium, and the hazard of erosion is moderate. This soil is used for range, watershed, wildlife, recreation, and dryfarmed and irrigated crops. Capability unit IIIe–3 dryland, IIIe–1 irrigated; Silty range site, 10- to 14-inch precipitation zone; windbreak suitability group 1.

Chugter complex, 2 to 15 percent slopes (CG).—This complex is made up of gently sloping to strongly sloping soils on fans, foot slopes, and terraces in red, burned shale uplands. It is about 60 percent Chugter loam, 25 percent Wibaux loam, and 15 percent Spearman and Hydro soils. The Hydro soil is in valley bottoms. The Wibaux and Spearman soils are on spur ridges and knolls surrounded by the Chugter soil. The Hydro soil in this complex has a profile similar to the one described as representative of the Hydro series, but it is reddish brown.

Runoff is medium, and the hazard of erosion is moderate. These soils are used mainly for range, wildlife, recreation, and watershed. Small areas of the Chugter soil are used for dryfarmed crops and hay where slopes are less than 12 percent. Capability unit IVe–3 dryland; Silty range site, 10- to 14-inch precipitation zone; windbreak suitability group 1.

Clapper Series

The Clapper series consists of deep, rolling and hilly and steep, well-drained soils on fans, eroded benches, and terraces. Slopes range from 8 to 35 percent. These soils formed in gravelly loam alluvium. Elevation ranges from 2,900 to 3,600 feet.

The native vegetation is mainly Hoods phlox, blue grama, broom snakeweed, bluebunch wheatgrass, and dryland sedges. Annual precipitation is 12 to 14 inches, the average annual soil temperature is 48° to 50° F, and the frost free period is 115 to 125 days.

In a representative profile the surface layer is dark grayish-brown gravelly loam about 4 inches thick. The underlying layer is gravelly and very gravelly loam and clay loam that extends to a depth of 60 inches or more. It is light brownish gray, light yellowish brown, and light gray in the upper part and pale yellow and light gray in the lower part.

Permeability is moderate. and available water capacity is low or moderate. The effective rooting depth is 60 inches or more. These soils are used mostly for range, wildlife, recreation, and watershed. Some small

areas on the margins of deeper soils are used for dryfarmed crops.

Representative profile of Clapper gravelly loam in an area of Clapper-Harvey complex, rolling, in grassland, 30 feet east and 10 feet south of a grove of pine trees at head of draw; 1,000 feet east and 80 feet south of the NW. corner sec. 11, T. 1 N., R. 31 E.

A—0 to 4 inches, dark grayish-brown (10YR 4/2) gravelly loam, very dark grayish brown (10YR 3/2) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; many fine roots; many very fine pores; 20 percent (volume) fragments of gravel size; clear, wavy boundary.

C1—4 to 10 inches, light brownish-gray (10YR 6/2) gravelly heavy loam, brown (10YR 5/3) moist; weak, medium, blocky structure; slightly hard, friable, sticky and plastic; many fine roots; 25 percent (volume) fragments of gravel size; strongly effervescent; thin lime casts on bottoms of pebbles; few fine, soft lime masses; gradual, wavy boundary.

C2—10 to 16 inches, light yellowish-brown (2.5Y 6/4) gravelly heavy loam, light olive brown (2.5Y 5/4) moist; massive; slightly hard, friable, sticky and plastic; many fine and very fine roots; 35 percent (volume) fragments of gravel size; strongly effervescent; thin lime casts on bottoms of pebbles; clear, wavy boundary.

C3ca—16 to 25 inches, light-gray (2.5Y 7/2) very gravelly heavy loam, light yellowish brown (2.5Y 6/4) moist; massive; hard, friable, very sticky and plastic; common fine and very fine roots; 45 percent (volume) fragments of gravel size; violently effervescent; moderately thick lime casts on bottoms of pebbles; few medium, soft lime masses; clear, wavy boundary.

C4ca—25 to 31 inches, pale-yellow (5Y 8/3) heavy loam, pale olive (5Y 6/3) moist; hard, friable, sticky and plastic; few very fine roots; many fine pores; 10 percent (volume) fragments of gravel size; violently effervescent; common coarse, soft lime masses; pebbles coated with lime; clear, wavy boundary.

C5—31 to 44 inches, pale-yellow (5Y 7/3) very gravelly heavy loam, pale olive (5Y 6/3) moist; massive; loose, friable, sticky and plastic; few very fine roots; 60 percent (volume) fragments of gravel size; strongly effervescent; few fine, soft lime masses; thin lime casts on bottoms of pebbles; clear, wavy boundary.

IIC6—44 to 60 inches, light-gray (5Y 7/2) light clay loam, olive (5Y 5/3) moist; massive; hard, friable, very sticky and very plastic; 5 percent (volume) fragments of gravel size; strongly effervescent.

The soil below a depth of 20 inches is 35 to 65 percent (volume) fragments of gravel and cobble size. Depth to the Cca horizon varies, but it is less than 30 inches. The A horizon is dark grayish-brown, grayish-brown, and brown loam or gravelly loam. The C horizon is 20 to 30 percent clay and 15 to 40 percent calcium carbonate. The C1 and C2 horizons are light brownish gray or light yellowish brown. The Cca horizon is white, light gray, or pale yellow.

Clapper-Harvey complex, rolling (CH).—This complex is made up of rolling soils on dissected terraces and terrace escarpments. It is 45 to 75 percent Clapper very gravelly and gravelly loam and 25 to 55 percent Harvey loam and gravelly loam. Slopes are 8 to 15 percent. The soils are intermixed, but the less gravelly Harvey soils are mostly on the wider, less steep ridges and knolls. Areas are mainly less than 3 acres in size. The very gravelly Clapper soil is on broken steep side slopes and in the deeper drainageways. The gravelly Clapper soil in this complex has the profile described as representative of the Clapper series. The Harvey soils have profiles similar to the ones described as representative of the Harvey series, but they are less steep, have a gravelly surface layer, and contain less carbonate between depths of 10 and 40 inches. Included in mapping are small areas of Terrace escarpments, gravelly.

Runoff is medium, and the hazard of erosion is moderate. These soils are used for range, wildlife, recreation, and watershed. Capability unit VIs–1 dryland; Silty range site, 10- to 14-inch precipitation zone; windbreak suitability group 3L.

Clapper-Midway complex, hilly (CK).—This complex is made up of hilly and steep soils on dissected gravelly terraces underlain by shale bedrock. It is 50 to 60 percent Clapper gravelly loam, 30 to 40 percent Midway clay loam, and 5 to 10 percent Shale outcrop. The numerous dissecting drainageways produce a pattern of narrow, sharply sloping ridges, drainageways, and coulees. The shale bedrock is exposed in drainageways and on the lower sides of the escarpments. Slopes range from 15 to 40 percent, but they are mostly 15 to 25 percent. The Clapper soil is on the terrace remnants and upper sides of escarpments between the drainageways. The Midway soil is on the lower sides of the ridges and hills where the terrace material no longer covers the shale bedrock.

Runoff is rapid, and the hazard of erosion is severe. These soils are used for range, wildlife, recreation, and watershed. Capability unit VIe–1 dryland; Thin Hilly range site, 10- to 14-inch precipitation zone; windbreak suitability group 4.

Colby Series

The Colby series consists of deep, nearly level to steep and gently undulating to hilly, well-drained soils on terraces, ridgetops, and hills. Slopes range from 1 to 35 percent. These soils formed in alluvium and eolian silt. Elevation ranges from 2,900 to 3,600 feet.

The native vegetation is mainly western wheatgrass, prairie junegrass, and green needlegrass. Annual precipitation is 13 to 15 inches, the average annual soil temperature is 47° to 49° F, and the frost-free period is 110 to 125 days.

In a representative profile the surface layer is gravish-brown silt loam about 5 inches thick. The underlying material is light brownish-gray, pale-yellow, light-gray, and light yellowish-brown silty clay loam and silt loam that extends to a depth of 65 inches or more.

Permeability is moderate, and available water capacity is high. The effective rooting depth is 60 inches or more. These soils are used for dryfarmed crops, hay, pasture, wildlife, recreation, watershed, and range.

Representative profile of Colby silt loam, 4 to 8 percent slopes, in grassland, 1,400 feet north and 1,320 feet west of the SE. corner sec. 23, T. 4 S., R. 29 E.

A11—0 to 2 inches, grayish-brown (2.5Y 5/2) silt loam, dark grayish brown (2.5Y 4/2) moist; weak, very fine, platy structure; hard, friable, slightly sticky and slightly plastic; many fine roots; slightly effervescent; clear, smooth boundary.

A12—2 to 5 inches, grayish-brown (2.5Y 5/2) silt loam, dark grayish brown (2.5Y 4/2) moist; weak, coarse, prismatic structure; hard, friable, slightly sticky and slightly plastic; many fine roots; common fine pores; slightly effervescent; clear, wavy boundary.

C1—5 to 11 inches, light brownish-gray (2.5Y 6/2) light silty clay loam, light olive brown (2.5Y 5/4) moist; weak, prismatic structure parting to weak, medium and coarse, blocky; hard, friable, sticky and plastic; many fine roots; common fine pores; strongly effervescent; few fine, soft lime masses; gradual, wavy boundary.

C2ca—11 to 15 inches, pale-yellow (2.5Y 7/4) silty clay loam, light olive brown (2.5Y 5/4) moist; weak, coarse, prismatic structure parting to weak, coarse, blocky; very hard, friable, very sticky and plastic; few fine roots; common fine pores; strongly effervescent; few medium and coarse, soft lime masses; gradual, wavy boundary.

C3ca—15 to 27 inches, pale-yellow (2.5Y 7/4) silty clay loam, light olive brown (2.5Y 5/4) moist; weak, coarse, prismatic structure parting to weak, coarse and medium, blocky; very hard, firm, sticky and very plastic; few fine roots; few fine pores; strongly effervescent; few medium and coarse, soft lime masses; gradual, wavy boundary.

C4ca—27 to 34 inches, light-gray (2.5Y 7/2) heavy silt loam, light olive brown (2.5Y 5/4) moist; weak, coarse, blocky structure; very hard, friable, sticky and plastic; very few fine roots; common fine pores; strongly effervescent; few coarse, soft lime masses; gradual, wavy boundary.

C5—34 to 65 inches, light yellowish-brown (2.5Y 6/4) silt loam, light olive brown (2.5Y 5/4) moist; massive; hard, friable, sticky and plastic; strongly effervescent.

Depth to segregated lime ranges from 8 to 10 inches. The soil between depths of 10 and 40 inches is 20 to 35 percent clay.

Colby silt loam, 4 to 8 percent slopes (Cm).—This soil is on high terraces. Areas consist of broad, flat-topped ridges separated by deep, smoothly sloping drainageways that are 10 to 15 feet wide. The soil has the profile described as representative of the series.

Runoff is medium, and the hazard of erosion is moderate. This soil is used for irrigated and dryfarmed crops, hay, wildlife, recreation, watershed, and range. Capability unit IIIe–3 dryland, IIIe–1 irrigated; Silty range site, 10- to 14-inch precipitation zone; windbreak suitability group 1.

Colby silt loam, 8 to 15 percent slopes (Cn).—This soil is on terraces and benches. Slopes are mostly 12 to 15 percent. The soil has a profile similar to the one described as representative of the series, but it is steeper and is silt loam below a depth of 20 inches.

Runoff is medium, and the hazard of erosion is severe. This soil is used for irrigated and dryfarmed crops, hay, wildlife, recreation, watershed, and range. Capability unit IVe–3 dryland, IVe–2 irrigated; Silty range site, 10- to 14-inch precipitation zone; windbreak suitability group 1.

Colby silty clay loam, 1 to 4 percent slopes (Co).—This soil is on fans and dissected terraces. Slopes are 75 to 250 feet long, and they are mostly 2 percent. The soil has a profile similar to the one described as representative of the series, but the surface layer is silty clay loam. Included in mapping are some areas of Keiser soils.

Runoff is slow, and the hazard of erosion is slight. This soil is used for irrigated and dryfarmed crops, hay, wildlife, recreation, and range. Capability unit IIIe–2 dryland, IIe–1 irrigated; Clayey range site, 10- to 14-inch precipitation zone; windbreak suitability group 1.

Colby silty clay loam, 4 to 8 percent slopes (Cp).—This soil is on fans, eroded terraces, and smoothly sloping breaks between terraces. Slopes are mostly 4 to 6 percent, but where drainageways dissect the terrace slopes, they are 7 to 8 percent. The soil has a profile similar to the one described as representative of the series, but the surface layer is silty clay loam.

Runoff is medium, and the hazard of erosion is moderate. This soil is used for irrigated and dryfarmed crops, hay, wildlife, recreation, watershed, and range. Capability unit IIIe–3 dryland, IIIe–1 irrigated; Clayey range site, 10- to 14-inch precipitation zone; windbreak suitability group 1.

Colby silty clay loam, 8 to 15 percent slopes (Cr).—This soil is on eroded parts of terraces, fans, and breaks between terraces. In many places it occurs as a band along the edges of major drainageways. Slopes are 75 to 200 feet long. The soil has a profile similar to the one described as representative of the series, but it is steeper and has a surface layer of silty clay loam. Included in mapping are some areas of Clapper and Harvey soils.

Runoff is medium, and the hazard of erosion is moderate. This soil is used for irrigated and dryfarmed crops, hay, wildlife, recreation, watershed, and range. Capability unit IVe–3 dryland, IVe–2 irrigated; Clayey range site, 10- to 14-inch precipitation zone; windbreak suitability group 1.

Colby-Beauvais silt loams, undulating (Cs).—This complex is made up of undulating soils on high gravelly terraces and hills mantled with loess. It is 60 to 75 percent Colby silt loam, 20 to 30 percent Beauvais silt loam, and 5 to 10 percent Terrace escarpments, gravelly. Slopes are 4 to 8 percent. The Colby soil is on the crests of surface undulations and along the edges of the deeper drainageways. The Beauvais soil is on the smooth parts of low ridges and between undulations. Terrace escarpments, gravelly, is at the intersections of deep drainageways and along the terrace edges where erosion has exposed the underlying gravelly terrace material.

Runoff is medium, and the hazard of erosion is moderate. These soils are used for irrigated and dryfarmed crops, hay, wildlife, recreation, watershed, and range. Capability unit IIIe–3 dryland, IIIe–1 irrigated; Silty range site, 10- to 14-inch precipitation zone; windbreak suitability group 1.

Colby-Beauvais silt loams, rolling (Ct).—This complex is made up of rolling soils on eroded, loess-mantled gravelly terraces and hills. It is about 70 percent Colby silt loam, 20 percent Beauvais silt loam, and 10 percent Terrace escarpments, gravelly. Slopes are 8 to 15 percent. The Colby soil has slopes of 12 to 15 percent. The Beauvais soil has smoother slopes of 8 to 10 percent and is between drainageways and on the broad crests of surface undulations. Terrace escarpments, gravelly, is at the points of ridges between deep drainageways and along the terrace edges where erosion has exposed the underlying gravelly materials. The Colby and Beauvais soils in this complex have profiles similar to the ones

described as representative of the Colby and Beauvais series, but they are steeper.

Runoff is rapid, and the hazard of erosion is severe. These soils are used for irrigated and dryfarmed crops, hay, wildlife, recreation, watershed, and range. Capability unit IVe–3 dryland, IVe–2 irrigated; Silty range site, 10- to 14-inch precipitation zone; windbreak suitability group 1.

Colby-Clapper silt loams, rolling (CU).—This complex is made up of rolling soils on short breaks between loess-mantled gravelly terraces on shale uplands. It is about 50 percent Colby silt loam and 50 percent Clapper silt loam. Areas are generally long and narrow. The Colby soil is at the tops and bottoms of breaks in the land surface. Slopes are mostly 8 to 10 percent, but they range to 15 percent. The Clapper soil is marked by surface gravel and occupies the midslope positions. The Clapper soil in this complex has a profile similar to the one described as representative of the Clapper series, but the surface layer is silt loam that is only 5 to 15 percent gravel.

Runoff is medium, and the hazard of erosion is severe. Most areas receive runoff from soils that lie above them. These soils are used for watershed, recreation, wildlife, range, hay, pasture, and dryfarmed crops. Capability unit IVe–3 dryland; Silty range site, 10- to 14-inch precipitation zone; windbreak suitability group 3L.

Colby-Keiser silty clay loams, 4 to 8 percent slopes (Cv).—This complex is made up of gently sloping soils on eroded parts of loess-mantled gravelly terraces in shale uplands. It is about 50 percent Colby silty clay loam and 50 percent Keiser silty clay loam. The Colby soil is on narrow ridges and hillsides and along the sides of deep drainageways where slopes are 7 to 8 percent. The Keiser soil has smooth slopes and is on wide ridges, between ridges and hills, and in shallow drainageways. Slopes are 4 and 5 percent. The Colby soil in this complex has a profile similar to the one described as representative of the Colby series, but the surface layer is silty clay loam and gravel is on the surface.

Runoff is medium, and the hazard of erosion is moderate. These soils are used for irrigated and dryfarmed crops, hay, wildlife, recreation, watershed, and range. Capability unit IIIe–3 dryland, IIIe–1 irrigated; Silty range site, 10- to 14-inch precipitation zone; windbreak suitability group 1.

Colby-Midway complex, 8 to 15 percent slopes (CW).—This complex is made up of strongly sloping soils on thinly loess-mantled gravelly terraces and benches. It is 50 to 80 percent Colby silty clay loam, 20 to 35 percent Midway silty clay loam, and 5 to 15 percent Harvey loam. Drainageways have cut through the mantle into the underlying shale. In places eolian silt has thickened the original terrace deposits. The Colby soil is on loess-mantled ridges, in tributary drainageways, and on the upper sides of the main valleys. The Midway soil is on the lower sides of ridges and valleys. The Harvey soil is on narrow ridges. The soils in this complex have profiles similar to the ones described as representative of their respective series, but gravel covers 1 to 15 percent of the surface.

Runoff is rapid, and the hazard of erosion is moderate. These soils are used for range, wildlife, recreation, watershed, pasture, and hay. Capability unit IVe–3 dryland; Clayey range site, 10- to 14-inch precipitation zone; windbreak suitability group 3M.

Colby association, rolling (CX).—This association is about 65 percent Colby silt loam and 35 percent Terrace escarpments, gravelly. It is on the deeply dissected edges of loess-mantled gravelly terraces. The Colby soil is on ridges and hills between drainageways. Terrace escarpments, gravelly, is on the sides and bottoms of drainageways. Slopes are mostly 8 to 12 percent on the Colby soil and 12 to 15 percent on Terrace escarpments, gravelly. The Colby soil in this complex has a profile similar to the one described as representative of the Colby series, but it is steeper.

Runoff is medium, and the hazard of erosion is moderate. These soils are used for range, wildlife, recreation, watershed, pasture, hay, and dryfarmed crops. Capability unit IVe–3 dryland; Silty range site, 10- to 14-inch precipitation zone; windbreak suitability group 3M.

Colby association, hilly (CY).—This association is about 50 percent Colby silt loam and 50 percent Terrace escarpments, gravelly. It occurs on the eroded edges of high, loess-mantled gravelly terraces. Slopes range from 50 to 200 feet long, and they are 15 to 35 percent. Areas are 1/8 to 1/4 mile wide and as much as 3/4 mile long. The Colby soil is on the upper edges of terraces and on ridges between drainageways. Terrace escarpments, gravelly, is on eroded terrace edges where underlying gravelly terrace material is exposed. Terrace escarpments, gravelly, has slopes of 25 to 35 percent. The Colby soil in this complex has a profile similar to the one described as representative of the Colby series, but on the steeper slopes it is underlain by gravelly loam at a depth of 30 to 40 inches.

Runoff is medium, and the hazard of erosion is severe. These soils are used for range, wildlife, recreation, and watershed. They are a source of road gravel. Capability unit VIe–1 dryland; Thin Hilly range site, 10- to 14-inch precipitation zone; windbreak suitability group 4.

Cushman Series

The Cushman series consists of moderately deep, undulating, well-drained soils on smooth ridges and hilltops in the sedimentary uplands. Slopes range from 4 to 8 percent. These soils formed in place from the underlying mixed shale and sandstone. Elevation ranges from 3,100 to 3,800 feet.

The native vegetation is mainly needleandthread, big sagebrush, western wheatgrass, and fringed sagewort. Annual precipitation is 12 to 14 inches, the average annual soil temperature is 47° to 49° F, and the frost-free period is 115 to 125 days.

In a representative profile the surface layer is brown loam about 5 inches thick. The subsoil is brown and light brownish-gray clay loam and loam about 11 inches thick. The substratum is light-gray loam. Shale bedrock is at a depth of about 35 inches. The soil is noncalcareous to a depth of about 9 inches and moderately calcareous below this depth. Lime in the substratum is segregated in soft masses and nodules.

Permeability is moderate, and available water capacity is low or moderate. The effective rooting depth is about 36 inches. These soils are used for range, wildlife, recreation, watershed, and dryfarmed crops.

Representative profile of Cushman loam, undulating, in a cultivated area, 400 feet east and 150 feet south of the NW. corner sec. 31, T. 1 S., R. 30 E.

Ap—0 to 5 inches, brown (10YR 5/3) loam, dark brown (10YR 3/3) moist; weak, subangular blocky structure; hard, friable, very sticky and plastic; few fine roots; abrupt, smooth boundary.

B2t—5 to 10 inches, brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; moderate, medium, prismatic structure parting to moderate, medium, blocky; hard, firm, very sticky and plastic; few very fine roots; thin, patchy films on peds; clear, wavy boundary.

B3—10 to 16 inches, light brownish-gray (2.5Y 6/2) loam, grayish brown (2.5Y 5/2) moist; moderate, medium, prismatic structure parting to moderate, medium, blocky; hard, friable, sticky and plastic; few very fine roots; thin, patchy clay films on peds; strongly effervescent; few medium lime mottles and mycelia; clear, wavy boundary.

C1ca—16 to 25 inches, light-gray (2.5Y 7/2) loam, light olive brown (2.5Y 5/4) moist; weak, angular blocky structure; hard, friable, sticky and plastic; few very fine roots; strongly effervescent; common medium and coarse lime mottles; gradual, wavy boundary.

C2—25 to 35 inches, light-gray (2.5Y 7/2) loam, grayish brown (2.5Y 5/2) moist; massive; hard, friable, sticky and plastic; strongly effervescent; few coarse lime mottles; clear, wavy boundary.

C3—35 to 40 inches, soft shale.

Depth to shale and sandstone ranges from 20 to 40 inches. Depth to the calcareous part of the soil ranges from 9 to 11 inches. The Ap horizon is grayish brown to brown. The B2t horizon is 27 to 33 percent clay. The C horizon ranges from light yellowish brown to light gray.

Cushman loam, undulating (Cz).—This undulating soil is on smooth ridges and hills in the sedimentary uplands. Slopes are 4 to 8 percent. Areas range from 10 to 50 acres in size. Included in mapping are small areas of Heldt, Midway, and Thurlow soils.

Runoff is medium, and the hazard of erosion is moderate. This soil is used for watershed, recreation, wildlife, range, hay, and dryfarmed crops. Capability unit IIIe–3 dryland; Silty range site, 10- to 14-inch precipitation zone; windbreak suitability group 3M.

Danvers Series

The Danvers series consists of deep, nearly level and gently sloping and gently undulating to hilly, well-drained soils on fans, benches, and high terraces. Slopes range from 0 to 20 percent. These soils formed in calcareous alluvium. Elevation ranges from 3,500 to 4,500 feet.

The native vegetation is mainly bluebunch wheatgrass, green needlegrass, broom snakeweed, prairie junegrass, and cudweed sagewort. Annual precipitation is 14 to 16 inches, the average annual soil temperature is 42° to 45° F, and the frost-free period is 95 to 110 days.

In a representative profile the surface layer is dark grayish-brown loam about 3 inches thick. The subsoil is dark grayish-brown, grayish-brown, and light yellowish-brown silty clay loam and silty clay about 12 inches thick. The substratum is pale-yellow, light yellowish-brown, and pale-brown silty clay loam and loam that extends to a depth of 65 inches or more.

Permeability is moderate, and available water capacity is high. The effective rooting depth is 60 inches or more. These soils are used mostly for dryfarmed crops, wildlife, recreation, watershed, and range. A few small areas are used for irrigated crops and pasture.

Representative profile of Danvers silty clay loam, gently undulating, in grassland, 600 feet south and 750 feet east of the NW. corner sec. 17, T. 5 S., R. 27 E.

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

B1—3 to 5 inches, dark grayish-brown (10YR 4/2) light silty clay loam, very dark grayish brown (10YR 3/2) moist; weak, medium, prismatic structure parting to moderate, very fine, blocky; hard, friable, sticky and plastic; common very fine roots; clear, smooth boundary.

B2t—5 to 10 inches, grayish-brown (10YR 5/2) silty clay, dark grayish brown (10YR 4/2) moist; moderate, medium, prismatic structure parting to moderate, fine and medium, blocky; very hard, firm, very sticky and very plastic; few very fine roots; many fine and medium pores; thin, continuous clay films on peds; clear, wavy boundary.

B3—10 to 15 inches, light yellowish-brown (2.5Y 6/4) silty clay loam, light olive brown (2.5Y 5/4) moist; moderate, medium, prismatic structure parting to moderate, fine and medium, blocky; hard, friable, sticky and plastic; few fine roots; strongly effervescent; few medium lime mottles; clear, wavy boundary.

C1ca—15 to 28 inches, pale-yellow (2.5Y 7/4) heavy silty clay loam, light yellowish brown (2.5Y 6/4) moist; weak, coarse, prismatic structure parting to weak, medium, blocky; hard, friable, very sticky and plastic; few very fine roots; violently effervescent; common coarse lime mottles and pockets 4 to 6 inches in diameter; clear, irregular boundary.

C2—28 to 43 inches, light yellowish-brown (2.5Y 6/4) silty clay loam, light olive brown (2.5Y 5/4) moist; weak, coarse, blocky structure; hard, friable, sticky and plastic; strongly effervescent; few coarse lime mottles; gradual, wavy boundary.

C3—43 to 65 inches, pale-brown (10YR 6/3) heavy loam, yellowish brown (10YR 5/4) moist; massive; hard, friable, slightly sticky and slightly plastic; strongly effervescent.

Depth to carbonates ranges from 9 to 15 inches. The A horizon is dark grayish brown and brown to light olive brown. The B2t horizon is dark brown and grayish brown to light olive brown. It is 35 to 45 percent clay.

Danvers silty clay loam, 0 to 1 percent slopes (Da).—This nearly level soil is on high benches and terraces in shale uplands. It has a profile similar to the one described as representative of the series, but it is less sloping.

Included with this soil in mapping are areas of Shaak, Judith, and Windham soils. The Shaak soil makes up as much as 10 to 30 percent of the area of this mapping unit. It is in level areas or slight depressions where surface drainage is very slow. The Judith and Windham soils are marked by surface gravel.

Runoff is slow, and the hazard of erosion is slight. This soil is used for dryfarmed and irrigated crops,

hay, wildlife, recreation, and range. Capability unit IIc–2 dryland, IIc–1 irrigated; Clayey range site, 15- to 19-inch precipitation zone; windbreak suitability group 2L.

Danvers silty clay loam, gently undulating (Db).—This gently undulating soil is on high benches, terraces, and fans in shale uplands. Slopes are 1 to 4 percent. The soil has the profile described as representative of the series.

Included with this soil in mapping are areas of Shaak and Judith soils that make up about 15 percent of the area of this mapping unit. Shaak soils are in level areas, and Judith soils have gravel on the surface.

Runoff is slow, and the hazard of erosion is moderate. This soil is used for dryfarmed and irrigated crops, hay, wildlife, recreation, and range. Capability unit IIe–2 dryland, IIe–1 irrigated; Clayey range site, 15- to 19-inch precipitation zone; windbreak suitability group 2L.

Danvers silty clay loam, undulating (Dc).—This undulating soil is on eroded parts of benches, terraces, and fans in shale uplands. Slopes are mostly 6 to 8 percent. The soil has a profile similar to the one described as representative of the series, but it is steeper.

Included with this soil in mapping are areas of Judith and Windham soils that make up about 20 percent of the area of this mapping unit. These included soils are lighter colored than Danvers soils, and they have gravel on the surface.

Runoff is medium, and the hazard of erosion is moderate. This soil is used for dryfarmed and irrigated crops, hay, wildlife, recreation, watershed, and range. Capability unit IIIe–2 dryland, IIIe–1 irrigated; Clayey range site, 15- to 19-inch precipitation zone; windbreak suitability group 2L.

Danvers cobbly silty clay loam, 1 to 4 percent slopes (Dd).—This nearly level and gently sloping soil is on broad benches and terraces in shale uplands. Slopes are short, and they are broken by low mounds and narrow ridges. The soil has a profile similar to the one described as representative of the series, but it is 10 to 25 percent limestone fragments of gravel, cobble, and stone size.

Included with this soil in mapping are areas of Judith and Windham soils that make up 10 to 20 percent of the area of this mapping unit.

Runoff is medium, and the hazard of erosion is moderate. This soil is used for recreation, wildlife, range, hay, and dryfarmed crops. Capability unit IIe–2 dryland; Clayey range site, 15- to 19-inch precipitation zone; windbreak suitability group 2L.

Danvers-Judith silty clay loams, gently undulating (De).—This complex is made up of gently undulating soils on benches and terraces in shale uplands. It is 55 to 70 percent Danvers silty clay loam and 30 to 45 percent Judith silty clay loam. Slopes range from 1 to 4 percent. The Danvers soil is on long slopes of 1 to 2 percent and in concave troughs of surface undulations. The Judith soil is on the convex surfaces of sharper ridges and crests.

Included with these soils in mapping are small areas of Windham soils. They are identified by surface cobbles and gravel along the deeper drainageways and sharp slope breaks in the terrace surface.

Runoff is slow, and the hazard of erosion is moderate. These soils are used for dryfarmed crops, hay, wildlife, recreation, and range. Capability unit IIe–2 dryland; Clayey range site, 15- to 19-inch precipitation zone; windbreak suitability group 3L.

Danvers-Judith silty clay loams, undulating (Df).—This complex is made up of undulating soils on benches and terraces in shale uplands. It is about 60 percent Danvers silty clay loam and 40 percent Judith silty clay loam. Slopes are 4 to 8 percent. The Danvers soil is on smooth areas between the drainageways, and the Judith soil is on low mounds, knolls, and the eroded edges of deep drainageways. The Danvers soil in this complex has a profile similar to the one described as representative of the Danvers series, but in places the upper part of the substratum does not have the nearly white lime layer. Included in mapping are small spots of Windham gravelly loam.

Runoff is medium, and the hazard of erosion is modate. These soils are used for dryfarmed crops, hay, wildlife, recreation, watershed, and range. Capability unit IIIe–2 dryland; Clayey range site, 15- to 19-inch precipitation zone; windbreak suitability group 3L.

Danvers-Judith silty clay loams, hilly (Dg).—This complex is made up of rolling and hilly soils on fans and foot slopes. It is 65 to 85 percent Danvers silty clay loam and 15 to 35 percent Judith silty clay loam. Slopes are mostly 15 to 20 percent, but they range to 8 percent. The Danvers soil is in drainageways, and the Judith soil is on the steeper slopes and the narrow ridges where surface gravel is common. The soils in this complex have profiles similar to the ones described as representative of their respective series, but the surface layer and subsoil are 5 to 20 percent coarse fragments of limestone. Also, a few limestone boulders as much as 2½ feet in diameter lie along deep drainageways.

Runoff is rapid, and the hazard of erosion is severe. These soils are used for dryfarmed crops, hay, pasture, watershed, wildlife, recreation, and range. Capability unit IVe–2 dryland; Thin Hilly range site, 15- to 19-inch precipitation zone; windbreak suitability group 3L.

Darret Series

The Darret series consists of moderately deep, undulating and rolling, well-drained soils on smooth parts of tilted bedrock uplands. Slopes range from 4 to 15 percent. These soils formed in place from pink, mixed shale and sandstone. Elevation ranges from 4,500 to 6,000 feet.

The native vegetation is mainly green needlegrass, western wheatgrass, cinquefoil, prairie junegrass, Idaho fescue, and wild geranium. Annual precipitation is 16 to 17 inches, the average annual soil temperature is 44° to 46° F, and the frost-free period is 90 to 110 days.

In a representative profile the surface layer is very dark grayish-brown silt loam about 4 inches thick. The subsoil is very dark grayish-brown, dark-brown, and reddish-brown silt loam, silty clay, and silty clay loam about 31 inches thick. Shale and sandstone bedrock is at a depth of about 35 inches.

Permeability is moderate, and available water capacity is moderate. The effective rooting depth is 30 to 40 inches. These soils are used for range, wildlife, recreation, and watershed.

Representative profile of Darret silt loam in an area of Reeder-Darret association, undulating, in grassland, 300 feet west and 200 feet north of the center of sec. 15, T. 7 S., R. 31 E.

A1—0 to 4 inches, very dark grayish-brown (10YR 3/2) silt loam, very dark brown (10YR 2/2) moist; moderate, very thin, platy structure parting to strong, very fine, granular; slightly hard, very friable, slightly sticky and slightly plastic; many very fine roots; clear, smooth boundary.

B1—4 to 7 inches, very dark grayish-brown (10YR 3/3) heavy silt loam, very dark brown (10YR 2/2) moist; moderate, fine, blocky structure; hard, friable, slightly sticky and plastic; many very fine roots; gradual, wavy boundary.

B21t—7 to 14 inches, dark-brown (7.5YR 4/3) heavy silty clay loam, dark brown (7.5YR 3/3) moist; weak, medium, prismatic structure parting to strong, very fine, blocky; very hard, firm, very sticky and very plastic; many very fine roots; common very fine pores; few very thin clay films on peds; 5 percent (volume) fine chert fragments of pebble size; gradual, wavy boundary.

B22t—14 to 22 inches, reddish-brown (5YR 5/4) silty clay, reddish brown (5YR 4/4) moist; moderate, medium, prismatic structure parting to strong, medium and fine, blocky; very hard, very firm, very sticky and very plastic; common very fine roots; common very fine pores; thin, patchy clay films on peds; 10 percent (volume) fine chert fragments of pebble size; gradual, wavy boundary.

B23t—22 to 30 inches, reddish-brown (5YR 5/5) silty clay, reddish brown (5YR 4/4) moist; moderate, medium, prismatic structure parting to strong, medium, blocky; very hard, very firm, very sticky and very plastic; common very fine roots; many very fine pores; very thin, patchy clay films on peds; few chert fragments of pebble size; clear, wavy boundary.

B3ca—30 to 35 inches, reddish-brown (2.5YR 5/4) silty clay loam, reddish brown (2.5YR 4/4) moist; weak, medium, blocky structure; very hard, firm, very sticky and plastic; few very fine roots; slightly effervescent; few fine and medium, soft lime masses; few limestone fragments of pebble size; gradual wavy boundary.

C—35 inches, variegated shale and hard sandstone.

Depth to shale and sandstone ranges from 20 to 40 inches. Depth to calcareous material ranges from 18 to 30 inches. The soil is 0 to 15 percent (volume) coarse fragments of limestone, chert, and hard sandstone. The A1 horizon is brown and grayish brown. The B horizon ranges from 36 to 45 percent clay. The B2t horizon is 9 to 24 inches in thickness.

Darret soils in the Big Horn County Area are mapped only with Reeder soils.

Dast Series

The Dast series consists of moderately deep, rolling to very steep, well-drained soils on ridges and hills of broad drainage divides. Slopes are mostly 8 to 90 percent, but they range to 4 percent. These soils formed in place from calcareous, weakly consolidated sandstone. Elevation ranges from 3,400 to 4,200 feet.

The native vegetation is needleandthread, little bluestem, prairie sandreed, yucca, hairy goldaster, salsify, and skunkbush sumac. Annual precipitation is 14 to 18 inches, the average annual soil temperature is 45° to 47° F, and the frost-free period is 105 to 115 days.

In a representative profile the surface layer is grayish-brown sandy loam about 3 inches thick. The subsoil is light olive-brown sandy loam about 8 inches thick. The underlying material is light yellowish-brown sandy loam. Weakly consolidated sandstone is at a depth of about 26 inches.

Permeability is moderately rapid, and available water capacity is low. The effective rooting depth is 20 to 40 inches. These soils are used for range, wildlife, recreation, and watershed.

Representative profile of Dast sandy loam, rolling, in grassland, 990 feet west and 425 feet north of the SE. corner sec. 8, T. 4 S., R. 37 E.

A1—0 to 3 inches, grayish-brown (2.5Y 5/2) light sandy loam, dark grayish brown (2.5Y 4/2) moist; weak, thin, platy structure; soft, very friable, nonsticky and slightly plastic; common very fine roots; clear, smooth boundary.

B—3 to 11 inches, light olive-brown (2.5Y 5/4) sandy loam, olive brown (2.5Y 4/4) moist; weak, coarse, prismatic structure; slightly hard, very friable, slightly sticky and slightly plastic; common very fine roots; few very fine pores; clear, wavy boundary.

C1—11 to 19 inches, light yellowish-brown (2.5Y 6/4) sandy loam, light olive brown (2.5Y 5/4) moist; massive; slightly hard, friable, nonsticky and slightly plastic; common very fine roots; slightly effervescent; gradual, wavy boundary.

C2—19 to 26 inches, light yellowish-brown (2.5Y 6/4) sandy loam, light olive brown (2.5Y 5/4) moist; massive; slightly hard, friable, nonsticky and slightly plastic; few very fine roots; strongly effervescent; gradual, wavy boundary.

C3—26 to 34 inches, weakly consolidated, platy sandstone.

Depth to sandstone ranges from 20 to 40 inches. The A1 horizon is brown and light olive brown. The C horizon is pale-brown, yellowish-brown, and light olive-brown sandy loam or fine sandy loam that is 10 to 15 percent clay.

Dast sandy loam, rolling (DHa).—This rolling soil is on sandstone uplands. Slopes are mostly 8 to 15 percent, but they range to 4 percent. They are smooth and less than 300 feet long. The soil has the profile described as representative of the series.

Runoff is medium, and the hazard of erosion is moderate. This soil is used for wildlife, recreation, watershed, range, hay, and pasture. Capability unit IVe–2 dryland; Sandy range site, 15- to 19-inch precipitation zone; windbreak suitability group 3M.

Dast sandy loam, hilly (DHb).—This hilly soil is on sandstone hills and ridges in the sandstone uplands. Slopes are mostly 15 to 25 percent, but they range to 35 percent. Slopes are short and are broken by Rock outcrop (sandstone) on the hillsides and narrow ridgetops. The soil has a profile similar to the one described as representative of the series, but it is steeper. Included in mapping are small areas of Parshall soils and some areas of Rock outcrop (sandstone).

Runoff is rapid, and the hazard of erosion is severe. This soil is used for range, wildlife, recreation, and watershed. Capability unit VIe–1 dryland; Sandy range site, 15- to 19-inch precipitation zone; windbreak suitability group 4.

Dast complex, hilly (DHc).—This complex is made up of hilly and very steep soils of the sedimentary uplands. It is about 50 percent Dast sandy loam, 15 percent Rock outcrop (sandstone) and Shale outcrop, and 35 percent Doney loam, Wayden silty clay loam, and Ascalon sandy loam. Slopes are mostly 25 to 35 per-

cent, but they range to 50 percent. The Ascalon soil is on foot slopes in wide valleys. The soils in this complex have profiles similar to the ones described as representative of their respective series, but they are steeper. Included in mapping are small spots of Vebar and Judith soils.

Runoff is rapid, and the hazard of erosion is severe. These soils are used for watershed, recreation, watershed, range, and game range. Capability unit VIe–1 dryland; Sandy range site, 15- to 19-inch precipitation zone; windbreak suitability group 4.

Dast complex, very steep (DHd).—This complex is made up of very steep soils of the sedimentary uplands. It is 50 to 60 percent Dast sandy loam, 15 to 25 percent Castner cobbly loam, 5 to 25 percent Armington silty clay loam, and 5 to 10 percent Rock outcrop. Slopes are mostly 35 to 60 percent, but they range to 90 percent. The Dast soil is on the smooth parts of valley sides. The Castner soil is along valley rims and above low rock ledges. The Armington soil is on the pink shale near the valley floor. The soils in this complex have profiles similar to the ones described as representative of their respective series, but they are steeper, and the Castner soil is more than 15 percent coarse fragments.

Runoff is rapid, and the hazard of erosion is severe. These soils are used for range, watershed, wildlife, and recreation. Capability unit VIIe–1 dryland; Thin Hilly range site, 15- to 19-inch precipitation zone; windbreak suitability group 4.

Dast-Parshall sandy loams, rolling (Dk).—This complex is made up of rolling soils in the sedimentary uplands. It is about 60 percent Dast sandy loam and 40 percent Parshall sandy loam. Slopes range from 8 to 15 percent. The Dast soil is on ridges and hills. The Parshall soil is in shallow drainageways and on short foot slopes below sharp ridges.

Runoff is medium, and the hazard of erosion is moderate. These soils are used for wildlife, recreation, watershed, range, hay, pasture, and dryfarmed crops. Capability unit IVe–2 dryland; Sandy range site, 15- to 19-inch precipitation zone; windbreak suitability group 3M.

Doney Series

The Doney series consists of moderately deep, gently sloping and rolling to very steep, well-drained soils on dissected hills, ridges, and knolls in the sedimentary uplands. Slopes range from 4 to 95 percent. These soils formed in place in material weathered from mixed loam shale, siltstone, and sandstone. Elevation ranges from 3,500 to 5,000 feet.

The native vegetation is mainly bluebunch wheatgrass, Hoods phlox, lupine, western wheatgrass, sagebrush, and green sagewort. Annual precipitation is 14 to 16 inches, the average annual soil temperature is 45° to 47° F, and the frost-free period is 90 to 105 days.

In a representative profile the surface layer is grayish-brown loam about 6 inches thick. The underlying layer is light yellowish-brown and pale-yellow loam that is about 30 percent shale fragments that can be easily crushed in the hand. Soft sandstone, siltstone, and loamstone are at a depth of about 21 inches.

Permeability is moderate, and available water capacity is low. The effective rooting depth is about 30 inches. These soils are used mostly for range, recreation, wildlife, and watershed. Small areas included with deeper soils in valleys and on broad ridges are used for dryfarmed crops.

Representative profile of Doney loam, rolling, in grassland, 1,300 feet west and 1,000 feet north of the SE. corner sec. 10, T. 6 S., R. 39 E.

A11—0 to 2 inches, grayish-brown (2.5Y 5/2) loam, very dark grayish brown (2.5Y 3/2) moist; weak, thin, platy structure; slightly hard, friable, slightly sticky and slightly plastic; many fine and very fine roots; clear, smooth boundary.

A12—2 to 6 inches, grayish-brown (2.5Y 5/2) heavy loam, dark grayish brown (2.5Y 4/2) moist; weak, medium, prismatic structure; hard, friable, slightly sticky and slightly plastic; common very fine roots; common very fine tubular pores; slightly effervescent; clear, wavy boundary.

C2—6 to 13 inches, light yellowish-brown (2.5Y 6/3) heavy loam, olive brown (2.5Y 4/3) moist; massive; hard, friable, slightly sticky and slightly plastic; common very fine roots; common very fine pores; strongly effervescent; diffuse, irregular boundary.

C2ca—13 to 21 inches, pale-yellow (2.5Y 7/3) loam, light olive brown (2.5Y 5/4) moist; moderate, medium, platy structure; hard, friable, slightly sticky and slightly plastic; common very fine roots between plates; 35 percent (volume) shale fragments; strongly effervescent; few medium, soft lime masses on the bottoms of the shale fragments; diffuse, irregular boundary.

C3—21 to 26 inches, soft, interbedded, very fine grained sandstone, silt stone, and limestone; few very fine roots following horizontal fractures.

Depth to shale and sandstone ranges from 20 to 40 inches. The C horizon ranges from 18 to 30 percent clay and is light brownish-gray, pale yellow, and pale brown. The lower part of the C horizon ranges from 5 to 35 percent (volume) shale and sandstone fragments.

Doney loam, rolling (DMa).—This rolling soil is on hills, ridges, and knolls of broad divides between major valleys in mixed shale and sandstone uplands. Slopes are mostly 8 to 15 percent. The soil has the profile described as representative of the series.

Included with this soil in mapping are spots of Wayden silty clay loam that make up as much as 25 percent of the area of this mapping unit.

Runoff is medium, and the hazard of erosion is moderate. This soil is used for wildlife, recreation, watershed, range, pasture, and dryfarmed crops. Capability unit IVe–2 dryland; Silty range site, 15- to 19-inch precipitation zone; windbreak suitability group 3M.

Doney silty clay loam, hilly (DMb).—This hilly and steep soil is on the north-facing slopes of deep valleys in dissected shale uplands. Slopes are mostly 15 to 25 percent, but they range to 35 percent. Areas are 300 to 1,000 feet wide and as much as one-half mile long. They extend from the valley floor to the top of the drainage divide. The soil has a profile similar to the one described as representative of the series, but it is steeper, has a surface layer of silty clay loam that is covered by a 1- to 2-inch mat of pine needles and twigs, and is noncalcareous to a depth of more than 12 inches.

Included with this soil in mapping are 1- to 3-acre

grassy openings. Steeper soils are included around scattered areas of Shale outcrop and low sandstone ledges.

Runoff is rapid, and the hazard of erosion is severe. This soil is used for watershed, recreation, woodland, and game range. The principal tree species are ponderosa pine and Rocky Mountain juniper. The average site index for the ponderosa pine is 70, and the crown density is more than 35 percent.

Timber harvest on this soil in many places causes moderate to severe erosion on logging and access roads, especially on the valley bottoms. Most of the timber is only 60 to 80 years old. The stands are generally open, and only isolated areas are overstocked. Timber harvest is limited to a few overstocked areas. Where areas of this soil are included in range, slash should be piled and roadways seeded after timber harvest. Capability unit VIe–1 dryland; not placed in a range site or windbreak suitability group.

Doney-Reeder loams, rolling (Dn).—This complex is made up of rolling soils on broad divides that consist of rounded ridges, hills, and knolls between drainageways in the sedimentary uplands. It is about 40 percent Doney loam, 40 percent Reeder loam, and 20 percent Farnuf loam. Slopes are 8 to 15 percent. The Doney soil has slopes of 12 to 15 percent and is on the narrow ridges and hills. The Reeder soil has slopes of 8 to 10 percent and is on wide ridges and in concave areas at the heads of drainageways and on hilltops.

Included with these soils in mapping are small areas, ½ acre to 2 acres in size, of Farnuf soils at the heads of short tributary drainageways. Also included are some areas of Regent, Savage, and Wayden soils where deep stream dissection has exposed clay loam and silty clay loam shale.

Runoff is medium, and the hazard of erosion is severe. These soils are used for wildlife, watershed, recreation, range, hay, pasture, and dryfarmed crops. Capability unit IVe–2 dryland; Silty range site, 15- to 19-inch precipitation zone; windbreak suitability group 3M.

Doney-Ringling complex, rolling (DOa).—This complex is made up of rolling soils on hills, knolls, and ridges between major valleys in the sedimentary uplands. It is about equal parts of Doney loam and Ringling channery loam and 25 percent Farnuf loam. Slopes are 9 to 15 percent. In places the areas form a band, one-fourth mile wide, on one side of a major valley. The Ringling soil generally caps ridges and hills. The Doney soil generally is below the Ringling soil in areas of highest relief and on hilltops and ridgetops elsewhere. The Farnuf soil is on short foot slopes and small fans at the mouths of short drainageways. The Ringling soil in this complex has the profile described as representative of the Ringling series. Included in mapping are spots of Arnegard soils.

Runoff is medium, and the hazard of erosion is severe. These soils are used for range, recreation, wildlife, and watershed. Capability unit VIe–1 dryland; Silty range site, 15- to 19-inch precipitation zone; windbreak suitability group 4.

Doney-Ringling complex, hilly (DOb).—This complex is made up of hilly soils in the sedimentary uplands. It is 40 to 60 percent Doney loam, 15 to 30 percent Ringling channery loam, 5 to 15 percent Rock outcrop, and 20 to 30 percent Wayden, Regent, Farnuf, Arnegard, and Reeder soils. Slopes range from 15 to 35 percent, but they are mostly 15 to 25 percent. The native vegetation is ponderosa pine, skunkbush sumac, snowberry, and pinegrass.

The Doney and Ringling soils in this complex are on the steeper hills, ridges, and upper valley sides. Rock outcrop occurs as ledges and escarpments along valley rims and on narrow ridgetops. The Farnuf and Arnegard soils are on foot slopes below rock ledges and in concave areas at the heads of drainageways. The Reeder and Regent soils are in saddles between hills and on smooth ridges. The Wayden soil occurs with the Doney soils. The soils of this complex have profiles similar to the ones described as representative of their respective series, but they are steeper.

Runoff is rapid, and the hazard of erosion is severe. These soils are used for range, watershed, recreation, and game range. Capability unit VIe–1 dryland; Thin Hilly range site, 15- to 19-inch precipitation zone; windbreak suitability group 4.

Doney-Ringling complex, very steep (DOc).—This complex is made up of steep and very steep soils typically along the steep rims and sides of major stream valleys or narrow ridges between deep valleys in deeply dissected sedimentary uplands. It is about 30 percent Doney loam, 30 percent Ringling channery loam, 20 percent Arnegard loam, and 25 percent Shale outcrop. Slopes are mostly more than 45 percent, but they range to 35 percent. Nearly perpendicular ledges of burned and fused red shale are on the valley rims and on the sides of narrow ridges. The native vegetation is ponderosa pine, juniper, skunkbush sumac, and ninebark.

The Ringling soil in this complex is on narrow ridges above Rock outcrop or on the upper sides of valleys. It has slopes of 45 to 60 percent. The Doney soil is on wide ridges and the lower sides of valleys. The Arnegard soil is on foot slopes below Rock outcrop and on the valley bottom. The soils of this complex have profiles similar to the ones described as representative of their respective series, but they are steeper and the Arnegard soil in places is redder.

Runoff is rapid, and the hazard of erosion is severe. These soils are used for range, watershed, recreation, and wildlife. Capability unit VIIe–1 dryland; Thin Breaks range site, 15- to 19-inch precipitation zone; windbreak suitability group 4.

Doney-Rock outcrop complex, very steep (DOd).—This complex is made up of very steep and steep soils in the sedimentary uplands. It is 50 to 65 percent Doney loam and Wayden silty clay loam and 35 to 50 percent Rock outcrop and Shale outcrop. Slopes are mostly 35 to 90 percent, but they range to 30 percent. They are 50 to 200 feet long. The Doney and Wayden soils are on narrow ridges and the upper sides of wide drainageways. They have slopes of 30 to 40 percent. The soils in this complex have profiles similar to the ones described as representative of their respective series, but they are steeper, and on the steepest slopes, the Doney soil in places is less than 20 inches deep over shale.

Included with these soils in mapping are sandstone ledges in the areas of Shale outcrop. Where these sand-

stone ledges occur, slabs of sandstone are scattered down the slope.

Runoff is rapid, and the hazard of erosion is very severe. These soils are used for range, wildlife, recreation, and watershed. Capability unit VIIe–1 dryland; Thin Breaks range site, 15- to 19-inch precipitation zone; windbreak suitability group 4.

Doney-Wayden complex, hilly (DOe).—This complex is made up of rolling to hilly and steep soils in the sedimentary uplands. It is 60 to 75 percent Doney loam and Wayden silty clay loam; 15 to 25 percent Farnuf, Savage, and Shaak soils; and 5 to 15 percent Rock outcrop and Shale outcrop. Slopes are mostly 15 to 35 percent, but they range to 8 percent. The landscape is approaching mature dissection—the ridgetops are rounded and well grassed. The ridges are less than 150 feet wide and are discontinuous, and the valleys are several hundred feet wide and have nearly continuous foot slopes. The Doney and Wayden soils are intermixed on the ridges and hills. They have slopes of 20 to 35 percent. The Farnuf, Savage, and Shaak soils are on short foot slopes and in the bottoms of wide valleys. They have slopes of 8 to 20 percent.

Runoff is rapid, and the hazard of erosion is severe. These soils are used for range, wildlife, recreation, and watershed. Capability unit VIe–1 dryland; Thin Hilly range site, 15- to 19-inch precipitation zone; windbreak suitability group 4.

Duncom Series

The Duncom series consists of shallow, rolling to very steep, well-drained soils on ridges and hills in the sedimentary uplands. Slopes range from 8 to 90 percent. These soils formed in place from gravelly and channery loam material weathered from the underlying limestone. Elevation ranges from 6,000 to 8,000 feet.

The native vegetation is dryland sedges, cinquefoil, Idaho fescue, club mosses, and elk thistle. Annual precipitation is 20 to 24 inches, the average annual soil temperature is 43° to 45° F, and the frost-free period is 60 to 70 days.

In a representative profile the surface layer is very dark grayish-brown gravelly loam about 4 inches thick. The underlying material is grayish-brown, pale-brown, and very pale brown gravelly and very gravelly loam. Limestone is at a depth of about 18 inches.

Permeability is moderate, and available water capacity is very low. The effective rooting depth is about 20 inches. These soils are used for range, wildlife, recreation, and watershed.

Representative profile of Duncom gravelly loam, in an area of Duncom complex, rolling, in grassland, 400 feet east and 300 feet north of the SW. corner sec. 7, T. 9 S., R. 32 E.

A1—0 to 4 inches, very dark grayish-brown (10YR 3/2) gravelly light loam, very dark brown (10YR 2/3) moist; weak, fine, crumb structure; soft, friable, nonsticky and slightly plastic; many very fine roots; very slightly effervescent in spots; 30 percent (volume) limestone and chert fragments of pebble size; clear, smooth boundary.

C1—4 to 9 inches, grayish-brown (10YR 5/2) gravelly loam, dark brown (10YR 4/3) moist; weak, fine, blocky structure; slightly hard, friable, slightly sticky and plastic; common very fine roots; strongly effervescent; 30 percent limestone, sandstone, and siltstone fragments of channer and pebble size; gradual, wavy boundary.

C2ca—9 to 13 inches, pale-brown (10YR 6/3) gravelly loam, brown (10YR 5/3) moist; massive; slightly hard, friable, slightly sticky and plastic; few very fine roots; violently effervescent; 40 percent (volume) limestone and sandstone fragments of pebble and channer size; flour lime in thin lime casts on pebbles; gradual, wavy boundary.

C3ca—13 to 18 inches, very pale brown (10YR 8/3) very gravelly loam, pale brown (10YR 6/3) moist; massive; hard, friable, sticky and plastic; few very fine roots; violently effervescent; 55 percent (volume) limestone and sandstone fragments of channer and pebble size; flour lime in thin lime casts of pebbles and channers; abrupt, wavy boundary.

R—18 inches, shattered dolomite.

Depth to bedrock ranges from 10 to 20 inches. Depth to the very strongly calcareous part of the soil ranges from 4 to 10 inches. The A1 and C1 horizons normally range from 10 to 30 percent (volume) coarse limestone and fine-grained sandstone fragments of pebble and channer size, and the lower part of the C horizons, from 40 to 60 percent. In places the A1 horizon is as much as 75 percent coarse fragments. The Cca horizon is pinkish gray, light gray, and white. The soil ranges from 10 to 25 percent clay.

Duncom soils in the Big Horn County Area contain more coarse fragments than typical for the series, but this difference does not alter the use or behavior of the soils.

Duncom extremely channery loam, rolling (Dp).—This rolling soil is on broad limestone ridges. Slopes are mostly 12 to 15 percent, but they range to 8 percent. The soil has a profile similar to the one described as representative of the series, but the surface layer is 50 to 75 percent limestone fragments of channer, cobble, and stone size. Included in mapping are spots of Rock outcrop (limestone).

Runoff is medium, and the hazard of erosion is moderate. This soil is used for range, wildlife, watershed, and recreation. Capability unit VIe–1 dryland; Shallow range site, 20- to 24-inch precipitation zone; windbreak suitability group 4.

Duncom complex, rolling (DR).—This complex is made up of rolling soils on ridges. It is about 85 percent stony, channery, gravelly, and cobbly Duncom soils and 15 percent Rock outcrop. Slopes are mostly 8 to 15 percent. They are short and in many places are broken by a series of narrow limestone outcrops or ledges. Areas range from 100 to 200 acres in size. The gravelly Duncom soil has the profile described as representative of the Duncom series. The other soils have profiles similar to the ones described as representative of their series, but the surface layer is 5 to 30 percent fragments of channer, stone, or cobble size.

Runoff is medium, and the hazard of erosion is moderate. These soils are used for range, wildlife, watershed, and recreation. Capability unit VIs–1 dryland; Shallow range site, 20- to 24-inch precipitation zone; windbreak suitability group 4.

Duncom-Tarrete association, rolling (DS).—This association is made up of rolling to hilly and moderately steep soils in the sedimentary uplands. It is about 50 percent Duncom channery loam, 30 percent Tarrete silty clay loam, and 20 percent Mayflower silt loam and Teton loam. Slopes are mostly 8 to 15 percent, but

they range to 20 percent. The Duncom soil in this association has a profile similar to the one described as representative of the Duncom series, but the surface layer is reddish brown to red. The Tarrete soil has the profile described as representative of the Tarrete series.

Runoff is medium, and the hazard of erosion is severe. These soils are used for range, watershed, recreation, and game range. Capability unit VIe–1 dryland; Shallow range site, 20- to 24-inch precipitation zone; windbreak suitability group 4.

Duncom-Tarrete association, hilly (DT).—This association is made up of hilly and steep soils in the sedimentary uplands. It is about 60 percent Duncom channery loam, 30 percent Tarrete silty clay loam, and 15 percent Rock outcrop and Shale outcrop. Slopes are mostly 15 to 25 percent, but they range to 35 percent. The Tarrete soil is on the lower sides of drainageways and hills just above the canyon rim. The Duncom soil in this association has a profile similar to the one described as representative of the Duncom series, but the surface layer is reddish brown. Included in mapping are small areas of Adel, Teton, and Mayflower soils.

Runoff is rapid, and the hazard of erosion is severe. These soils are used for range, watershed, recreation, and game range. Capability unit VIe–1 dryland; Shallow range site, 20- to 24-inch precipitation zone; windbreak suitability group 4.

Eltsac Series

The Eltsac series consists of moderately deep, undulating to hilly and steep, well-drained soils on smooth ridges and hills in the sedimentary uplands. Slopes range from 4 to 35 percent. These soils formed in place in clay material weathered from the underlying platy clay shale. Elevation ranges from 3,500 to 4,500 feet.

The native vegetation is mainly western wheatgrass, white loco, vetch, and Hoods phlox. Annual precipitation is 14 to 16 inches, the average annual soil temperature is 45° to 47° F, and the frost-free period is 100 to 110 days.

In a representative profile the surface layer is grayish-brown silty clay about 2 inches thick. The subsoil is grayish-brown clay about 3 inches thick. The substratum is grayish-brown, light brownish-gray, and light olive-gray clay. Clay shale is at a depth of about 34 inches.

Permeability is very slow, and available water capacity is low. The effective rooting is about 30 inches. These soils are used for range, wildlife, recreation, and watershed.

Representative profile of Eltsac clay, rolling, in grassland, 200 feet north of the center of sec. 2, T. 8 S., R. 33 E.

A—0 to 2 inches, grayish-brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; strong, thin, platy structure; hard, firm, very sticky and very plastic; common fine roots; weakly effervescent; clear, smooth boundary.

B—2 to 5 inches, grayish-brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; weak, coarse, prismatic structure parting to moderate, coarse, blocky; extremely hard, very firm, very sticky and very plastic; common fine roots between peds; few fine pores; strongly effervescent; few indistinct, fine lime masses; clear, wavy boundary.

C1—5 to 12 inches, grayish-brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; moderate, coarse, prismatic structure parting to moderate, coarse, blocky; extremely hard, very firm, very sticky and extremely plastic; few fine roots; strongly effervescent; few fine, soft lime masses; gradual, wavy boundary.

C2—12 to 19 inches, light brownish-gray (2.5Y 6/2) clay, dark grayish brown (2.5Y 4/2) moist; moderate, coarse, prismatic structure parting to moderate coarse, blocky; extremely hard, very firm, very sticky and extremely plastic; few medium roots; few distinct slickensides; strongly effervescent; few coarse, soft lime masses; gradual, wavy boundary.

C3—19 to 24 inches, light olive-gray (5Y 6/2) clay, olive (5Y 5/3) moist; moderate, medium and coarse, blocky structure; extremely hard, very firm, very sticky and very plastic; common fine roots; few partly weathered shale fragments; strongly effervescent; clear, wavy boundary.

C4cs—24 to 34 inches, light olive-gray (5Y 6/2) clay, olive gray (5Y 4/2) moist; moderate, medium, subangular blocky structure; very hard, firm, very sticky and very plastic; very few fine roots; many partly weathered shale fragments; few coarse gypsum crystals; strongly effervescent; clear, wavy boundary.

C5—34 to 46 inches, platy clay shale.

Depth to shale ranges from 20 to 40 inches. The soil between depths of 10 and 40 inches ranges from 60 to 70 percent clay. The A horizon is grayish brown, olive gray, and light olive brown. The C horizon is grayish brown, light brownish gray, olive gray, light olive brown, and light olive gray. The C3 and C4 horizons range from 5 to 30 percent shale fragments.

Eltsac clay, undulating (Ec).—This undulating soil is on broad, low hills between drainageways in smooth sedimentary uplands. Slopes are mostly 5 and 6 percent, but they range from 4 to 8 percent. They are 200 to 300 feet long. The soil has a profile similar to the one described as representative of the series, but it is less sloping. Included in mapping are areas of Marias soils.

Runoff is medium, and the hazard of erosion is moderate. This soil is used for range, wildlife, recreation, watershed, and dryfarmed crops. Capability unit IIIe–2 dryland; Clayey range site, 15- to 19-inch precipitation zone; windbreak suitability group 3M.

Eltsac clay, rolling (Ed).—This rolling soil is on hills and ridges and in shallow drainageways in the sedimentary uplands. Slopes range from 8 to 15 percent but are mostly 12 to 15 percent. The soil has the profile described as representative of the series. Included in mapping are narrow bands, 3 to 5 acres is size, of Norbert soils.

Runoff is medium, and the hazard of erosion is moderate. This soil is used for range, wildlife, recreation, watershed, and pasture. Capability unit IVe–2 dryland; Clayey range site, 15- to 19-inch precipitation zone; windbreak suitability group 3M.

Eltsac cobbly clay, hilly (EH).—This hilly and steep soil is on ridges, knolls, and hills of deeply dissected gravelly terraces underlain by shale. Along the deeper valleys and parallel to them, slips and landslides occur and occasionally trap drainage water to form ponds. Slopes are mostly 15 to 25 percent, but they range from 15 to 35 percent. The soil has a profile similar to the

one described as representative of the series, but it is steeper, and fragments of cobble and gravel size are on the surface. Included in mapping are one-half-acre patches of Judith, Windham, and Norbert soils.

Runoff is medium, and the hazard of erosion is slight. This soil is used for range, wildlife, recreation, and watershed. Capability unit VIe–1 dryland; Thin Hilly range site, 15- to 19-inch precipitation zone; windbreak suitability group 4.

Farnuf Series

The Farnuf series consists of deep, nearly level to strongly sloping, well-drained soils on fans, foot slopes, and terraces. Slopes range from 0 to 15 percent. These soils formed in alluvium. Elevation ranges from 3,300 to 4,200 feet.

The native vegetation is big sagebrush, green needlegrass, Sandberg bluegrass, lupine, and snowberry. Annual precipitation is 14 to 17 inches, the average annual soil temperature is 44° to 46° F, and the frost-free period is 110 to 125 days.

In a representative profile the surface layer is very dark grayish-brown loam about 5 inches thick. The subsoil is dark grayish-brown, grayish-brown, and pale-brown loam and clay loam about 29 inches thick. The substratum is light yellowish-brown loam that extends to a depth of 63 inches or more.

Permeability is moderate, and available water capacity is high. The effective rooting depth is 60 inches or more. These soils are used for dryfarmed and irrigated crops, wildlife, recreation, watershed, and range.

Representative profile of Farnuf loam, 2 to 4 percent slopes, in grassland, 1,980 feet east and 330 feet north of the SW. corner sec. 9, T. 7 S., R. 39 E.

A11—0 to 2 inches, very dark grayish-brown (10YR 3/2) loam, very dark brown (10YR 2/2) moist; weak, very fine, crumb structure; soft, friable, slightly sticky and slightly plastic; clear boundary.

A12—2 to 5 inches, very dark grayish-brown (10YR 3/2) loam, very dark brown (10YR 2/2) moist; moderate, medium, platy structure; slightly hard, friable, slightly sticky and slightly plastic; gradual boundary.

B1—5 to 10 inches, dark grayish-brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; weak, medium, prismatic structure parting to weak, medium, blocky; hard, friable, sticky and plastic; gradual boundary.

B21—10 to 16 inches, grayish-brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) moist; moderate, medium, prismatic structure parting to moderate, medium, blocky; hard, friable, sticky and plastic; thin, patchy clay films on peds; clear, wavy boundary.

B22—16 to 24 inches, grayish-brown (10YR 5/2) clay loam, dark brown (10YR 4/3) moist; moderate, medium, prismatic structure parting to moderate, medium, blocky; hard, friable, sticky and plastic; thin, patchy clay films on peds; slightly effervescent; gradual, wavy boundary.

B3ca—24 to 34 inches, pale-brown (10YR 6/3) loam, brown (10YR 5/3) moist; weak, medium, blocky structure; hard, friable, slightly sticky and plastic; strongly effervescent; network of common fine lime threads; gradual boundary.

C1ca—34 to 43 inches, light yellowish-brown (2.5Y 6/4) loam, light olive brown (2.5Y 5/4) moist; massive; hard, friable, slightly sticky and plastic; strongly effervescent; few threads of lime; gradual boundary.

C2—43 to 63 inches, light yellowish-brown (2.5Y 6/4) loam, light olive brown (2.5Y 5/4) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; strongly effervescent.

Depth to calcareous material ranges from 10 to 20 inches. The A and B2 horizons range from 0 to 5 percent shale fragments, and the C horizon, from 0 to 15 percent. Hue ranges from 7.5YR to 2.5Y throughout. The A horizon is dark grayish brown and brown. The B2t horizon is loam or clay loam. The Cca horizon ranges from light brown to light olive brown.

Farnuf loam, 0 to 2 percent slopes (Fa).—This nearly level soil is on smooth stream terraces. Areas are 5 to 15 acres in size. The soil has a profile similar to the one described as representative of the series, but it is less sloping. Included in mapping are 1- to 2-acre patches of Frazer soils.

Runoff is slow, and the hazard of erosion is slight. This soil is used for irrigated and dryfarmed crops, hay, wildlife, recreation, and range. Capability unit IIc–2 dryland, IIc–1 irrigated; Silty range site, 15- to 19-inch precipitation zone; windbreak suitability group 1.

Farnuf loam, 2 to 4 percent slopes (Fb).—This gently sloping soil is on terraces and fans. Areas are 5 to 35 acres in size. Slopes are 3 to 4 percent on the fans and 2 percent on the terraces. They are 150 to 350 feet long. The soil has the profile described as representative of the series. Included in mapping are some areas of soils that have a few red shale fragments in the lower part of the substratum.

Runoff is slow, and the hazard of erosion is moderate. This soil is used for irrigated and dryfarmed crops, hay, wildlife, recreation, and range. Capability unit IIe–2 dryland, IIe–1 irrigated; Silty range site, 15- to 19-inch precipitation zone; windbreak suitability group 1.

Farnuf loam, 4 to 8 percent slopes (Fc).—This sloping soil is on foot slopes and fans. Areas are 5 to 20 acres in size. Slopes are 4 to 5 percent on the fans and 7 to 8 percent on the upper half of the foot slopes. The soil has a profile similar to the one described as representative of the series, but it is steeper and has a few coarse fragments of red shale in the lower part of the substratum. Included in mapping are small spots of Doney soils.

Runoff is medium, and the hazard of erosion is moderate. This soil is used for irrigated and dryfarmed crops, hay, wildlife, recreation, and range. Capability unit IIIe–2 dryland, IIIe–1 irrigated; Silty range site, 15- to 19-inch precipitation zone; windbreak suitability group 1.

Farnuf-Doney association, sloping (FD).—This association is made up of strongly sloping soils on fans and foot slopes. It is 65 to 85 percent Farnuf loam and 15 to 25 percent Doney loam. Slopes are mostly 8 to 15 percent, but they range to 4 percent. The Farnuf soil in this association has a profile similar to the one described as representative of the series, but it is steeper. The Doney soil has the profile described as representative of the Doney series. Included in mapping are spots of Macar soils and gravelly Arnegard soils.

Runoff is medium, and the hazard of erosion is moderate. These soils are used for watershed, recreation, wildlife, range, dryfarmed crops, hay, and pasture.

Capability unit IVe–2 dryland; Silty range site, 15- to 19-inch precipitation zone; windbreak suitability group 2M.

Fergus Series

The Fergus series consists of deep, gently sloping to strongly sloping, well-drained soils on foot slopes, fans, and narrow terraces. Slopes range from 2 to 15 percent. These soils formed in silty clay loam and silt loam alluvium washed from red-colored, fine-grained shale and sandstone. Elevation ranges from 3,800 to 4,600 feet.

The native vegetation is mainly green needlegrass, prairie junegrass, silver sagebrush, cudweed sagewort, snowberry, and lupine. Annual precipitation is 15 to 17 inches, the average annual soil temperature is 44° to 46° F, and the frost-free period is 90 to 110 days.

In a representative profile the surface layer is dark reddish-gray silt loam about 9 inches thick. The subsoil is reddish-brown silt loam and silty clay loam about 22 inches thick. The substratum is reddish-brown and reddish-yellow silt loam that extends to a depth of 62 inches or more.

Permeability is moderately slow, and available water capacity is high. The effective rooting depth is 60 inches or more. These soils are used for range, wildlife, recreation, watershed, dryfarmed crops, hay, and pasture.

Representative profile of Fergus silt loam, 4 to 8 percent slopes, in grassland, 1,300 feet west of the center of sec. 25, T. 6 S., R. 28 E.

A11—0 to 4 inches, dark reddish-gray (5YR 4/2) silt loam, dark reddish brown (5YR 2/2) moist; weak, medium, crumb structure; slightly hard, very friable, nonsticky and slightly plastic; many very fine and micro roots; gradual, wavy boundary.

A12—4 to 9 inches, dark reddish-gray (5YR 4/2) silt loam, dark reddish brown (5YR 2/2) moist; weak, coarse, prismatic structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; clear, wavy boundary.

B1—9 to 14 inches, reddish-brown (5YR 4/3) silt loam, dark reddish brown (5YR 3/2) moist; moderate, medium, prismatic structure; hard, friable, sticky and plastic; common very fine roots; clear, wavy boundary.

B21t—14 to 19 inches, reddish-brown (5YR 4/4) silty clay loam, dark reddish brown (5YR 3/3 crushed, 3/2 coated) moist; weak, medium, prismatic structure parting to moderate, medium, blocky; very hard, friable, sticky and plastic; common very fine roots; many very fine pores; thin, patchy clay films on peds; clear, wavy boundary.

B22t—19 to 25 inches, reddish-brown (5YR 5/4) silty clay loam, dark reddish brown (5YR 3/3) moist; weak, medium, prismatic structure parting to moderate, medium, blocky; very hard, firm, very sticky and very plastic; many very fine pores; thin, patchy clay films on peds; clear, wavy boundary.

B3—25 to 31 inches, reddish-brown (5YR 5/5) silty clay loam, reddish brown (5YR 4/5) moist; weak, medium, blocky structure; very hard, firm, sticky and plastic; many very fine pores; clear, wavy boundary.

C1ca—31 to 38 inches, reddish-brown (5YR 5/5) silt loam, yellowish red (5YR 4/6) moist; weak, coarse, blocky structure; very hard, friable, sticky and plastic; common very fine pores; strongly effervescent; few fine lime threads coating root channels; gradual, wavy boundary.

C2—38 to 62 inches, reddish-yellow (5YR 6/5) silt loam, yellowish red (5YR 4/5) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; strongly effervescent; common fine lime threads.

Depth to calcareous material ranges from 20 to 40 inches. The A horizon is silt loam or loam that ranges from dark brown to dark reddish brown and dark reddish gray in hue of 2.5YR to 7.5YR. The B2t horizon ranges from 35 to 42 percent clay. The Cca horizon ranges from light reddish-brown to brown silt loam to heavy silty clay loam.

Fergus silt loam, 2 to 4 percent slopes (Fe).—This soil is on terraces and fans. Areas are 10 to 15 acres in size. The soil has a profile similar to the one described as representative of the series, but it is less sloping. Included in mapping are narrow bands of Darret soils.

Runoff is slow, and the hazard of erosion is moderate. This soil is used for recreation, wildlife, range, hay, and dryfarmed crops. Capability unit IIIe–2 dryland; Silty range site, 15- to 19-inch precipitation zone; windbreak suitability group 1.

Fergus silt loam, 4 to 8 percent slopes (Ff).—This soil is on foot slopes and fans. Slopes are mostly 7 and 8 percent, and they range from 200 to 300 feet long. The soil has the profile described as representative of the series.

Runoff is medium, and the hazard of erosion is moderate. Some areas receive runoff from soils above them. These soils are used for watershed, recreation, wildlife, range, hay, and dryfarmed crops. Capability unit IIIe–2 dryland; Silty range site, 15- to 19-inch precipitation zone; windbreak suitability group 1.

Fergus silt loam, 8 to 15 percent slopes (Fg).—This soil is on foot slopes that surround isolated red hills. Slopes range from 200 to 600 feet long and are mostly 12 to 15 percent. The soil is at elevations of more than 5,000 feet and is slightly cooler than typical for the series, but this difference does not affect use and management of the soil. Included in mapping are areas of Abac soils 1 acre to 3 acres in size.

Runoff is medium, and the hazard of erosion is severe. These soils are used for wildlife, recreation, watershed, range, and pasture. Capability unit IVe–2 dryland; Silty range site, 15- to 19-inch precipitation zone; windbreak suitability group 1.

Fort Collins Series

The Fort Collins series consists of deep, nearly level to sloping and rolling, well-drained soils on terraces and fans in stream valleys. Slopes range from 0 to 15 percent These soils formed in loam and clay loam alluvium. Elevation ranges from 2,800 to 3,400 feet.

The native vegetation is mainly blue grama, needleandthread, big sagebrush, and cheatgrass. Annual precipitation is 12 to 14 inches, the average annual soil temperature is 47° to 49° F, and the frost-free period is 115 to 125 days.

In a representative profile the surface layer is grayish-brown and brown loam about 4 inches thick. The subsoil is brown and grayish-brown clay loam and loam about 18 inches thick. The substratum is light brownish-gray and light-gray loam that extends to a depth of 65 inches or more.

Permeability is moderate, and available water capacity is high. The effective rooting depth is 60 inches

or more. These soils are used for irrigated and dryfarmed crops, watershed, wildlife, recreation, and range.

Representative profile of Fort Collins loam, 2 to 4 percent slopes, in grassland, 330 feet south and 800 feet east of the NW. corner sec. 27, T. 1 N., R. 38 E.

A—0 to 3 inches, grayish-brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) moist; moderate, medium, platy structure; soft, friable, nonsticky and nonplastic; clear, smooth boundary.

AB—3 to 4 inches, brown (10YR 5/3) loam, dark grayish brown (10YR 4/2) moist; moderate, medium, platy structure; slightly hard, friable, slightly sticky and slightly plastic; clear, smooth boundary.

B21t—4 to 9 inches, brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; moderate, medium, prismatic structure parting to moderate, medium, blocky; hard, firm, sticky and slightly plastic; thin, continuous clay films on peds; gradual, wavy boundary.

B22t—9 to 12 inches, brown (10YR 5/3) clay loam, brown (10YR 4/3) moist; moderate, medium, prismatic structure parting to moderate, medium, blocky; hard, firm, slightly sticky and slightly plastic; thin, patchy clay films on peds; gradual, wavy boundary.

B3ca—12 to 22 inches, grayish-brown (10YR 5/2) loam, grayish brown (10YR 4/2) moist; weak, prismatic structure parting to weak, medium, blocky; hard, friable, slightly sticky and plastic; strongly effervescent; few fine lime mottles; clear, wavy boundary.

C1—22 to 27 inches, light brownish-gray (2.5Y 6/2) loam, light olive brown (2.5Y 5/4) moist; weak, coarse, prismatic structure; hard, friable, slightly sticky and slightly plastic; strongly effervescent; few medium and coarse lime mottles; gradual, wavy boundary.

C2—27 to 33 inches, light brownish-gray (2.5Y 6/2) loam, light olive brown (2.5Y 5/4) moist; massive; hard, friable, slightly sticky and slightly plastic; strongly effervescent; gradual, wavy boundary.

C3—33 to 65 inches, light-gray (2.5Y 7/2) loam that grades to silt loam below a depth of 53 inches; massive; strongly effervescent.

Depth to calcareous material ranges from 7 to 12 inches. The upper 24 inches of the soil ranges from 0 to 10 percent coarse fragments. Hue ranges from 10YR to 5Y throughout. The A horizon is light brownish gray and grayish brown. The B2t horizon ranges from grayish brown to olive brown. The Bca horizon is grayish brown and olive. The C horizon is stratified with fine sandy loam, clay loam, and silt loam.

Fort Collins loam, 0 to 2 percent slopes (Fh).—This soil is on stream terraces and fans. It has a profile similar to the one described as representative of the series, but it is less sloping. Included in mapping are patches of McRae loam, 1 acre to 2 acres in size.

Runoff is slow, and the hazard of erosion is slight. This soil is used for irrigated and dryfarmed crops, hay, wildlife, recreation, and range. Capability unit IIIc–1 dryland, IIc–1 irrigated; Silty range site, 10- to 14-inch precipitation zone; windbreak suitability group 1.

Fort Collins loam, 2 to 4 percent slopes (Fk).—This soil is on fans and terraces. Areas are 5 to 40 acres in size. The soil has the profile described as representative of the series.

Included with this soil in mapping are small spots of McRae and Thurlow soils. Also included on gravelly terraces are areas of a soil, similar to this Fort Collins soil, that in places has strata of loamy sand below a depth of 30 inches.

Runoff is slow, and the hazard of erosion is moderate. This soil is used for irrigated and dryfarmed crops, hay, wildlife, recreation, and range. Capability unit IIIe–3 dryland, IIe–1 irrigated; Silty range site, 10- to 14-inch precipitation zone; windbreak suitability group 1.

Fort Collins loam, 4 to 8 percent slopes (Fm).—This soil is in tributary drainageways to major stream valleys on foot slopes, fans, and terraces. Areas are 20 to 50 acres in size. Slopes range from 250 to 450 feet long. The soil has a profile similar to the one described as representative of the series, but it is steeper. Included in mapping are narrow bands of McRae soils.

Runoff is medium, and the hazard of erosion is moderate. This soil is used for dryfarmed and irrigated crops, hay, wildlife, recreation, watershed, and range. Capability unit IIIe–3 dryland, IIIe–1 irrigated; Silty range site, 10- to 14-inch precipitation zone; windbreak suitability group 1.

Fort Collins loam, channeled, 4 to 8 percent slopes (Fn).—This soil is on fans, narrow terraces, and foot slopes. The land surface is dissected by many gullies that are 10 to 30 feet wide. As much as 30 percent of some areas consist of gullies that are 5 to 15 feet deep. Slopes are 2 to 7 percent between the gullies and 8 to 15 percent on the sides of the gullies. The soil has a profile similar to the one described as representative of the series, but it is steeper and has deep gullies.

Included with this soil in mapping are patches of McRae soils, 1 acre to 2 acres in size. These included soils make up about 10 percent of the total area of this mapping unit.

Runoff is rapid, and the hazard of erosion is severe. This soil is used for wildlife, recreation, watershed, range, hay, and pasture. Capability unit IVe–3 dryland; Silty range site, 10- to 14-inch precipitation zone; windbreak suitability group 1.

Frazer Series

The Frazer series consists of deep, nearly level to steep, well-drained soils on bottom lands, fans, and low terraces. Slopes range from 0 to 35 percent. These soils formed in silty clay loam and silty clay alluvium washed from mixed shale land. Elevation ranges from 3,300 to 4,300 feet.

The native vegetation is mainly western wheatgrass, green needlegrass, Sandberg bluegrass, western yarrow, and Japanese brome. Annual precipitation is 14 to 16 inches, the average annual soil temperature is 45° to 47° F, and the frost-free period is 105 to 120 days.

In a representative profile the surface layer is grayish-brown silty clay loam about 13 inches thick. The underlying material is grayish-brown, brownish-gray, and light yellowish-brown silty clay loam and silt loam that extends to a depth of more than 65 inches.

Permeability is slow, and available water capacity is high. The effective rooting depth is 60 inches or more. These soils are used for irrigated and dryfarmed crops, wildlife, recreation, watershed, and range.

Representative profile of Frazer silty clay loam, in grassland, 900 feet east and 1,500 feet north of the SW. corner sec. 22, T. 5 S., R. 35 E.

A1—0 to 13 inches, grayish-brown (2.5Y 5/2) silty clay loam, very dark grayish brown (2.5Y 3/2) moist; moderate, fine, subangular blocky structure; hard, friable, sticky and plastic; many very fine roots; many very fine pores; slightly effervescent; gradual, wavy boundary.

C1—13 to 20 inches, grayish-brown (2.5Y 5/2) heavy silty clay loam, dark grayish brown (2.5Y 4/2) moist; weak, medium and fine, subangular blocky structure; very hard, firm, very sticky and very plastic; common very fine roots; common very fine tubular pores; slightly effervescent; gradual, wavy boundary.

C2—20 to 38 inches, brownish-gray (2.5Y 6/2) silty clay loam, olive brown (2.5Y 4/3) moist; massive; hard, friable, sticky and plastic; few very fine roots; common very fine tubular pores; slightly effervescent; few fine, soft lime masses; gradual, wavy boundary.

C3—38 to 65 inches, light yellowish-brown (2.5Y 6/3), stratified silt loam and silty clay loam, light olive brown (2.5Y 5/3) moist; massive; hard, friable, sticky and plastic; few very fine tubular pores; slightly effervescent.

The soil between depths of 10 and 40 inches is silty clay loam, clay loam, or silty clay. Hue is 2.5Y or 10YR throughout. The A horizon is dark grayish brown and grayish brown.

Frazer silty clay loam (Fo).—This soil is in old stream channels and oxbows on low terraces and flood plains. Slopes are 0 to 2 percent. Areas range from 3 to 20 acres in size. The soil has the profile described as representative of the series.

Runoff is slow, and the hazard of erosion is slight. Flooding is a hazard in places, and in others the water table is at a depth of 5 feet early in summer along perennial streams. In places the strata of silty clay below a depth of 30 inches have visible salt crystals and are slightly saline. This soil is used for dryfarmed and irrigated crops, hay, wildlife, recreation, and range. Capability unit IIe–2 dryland, IIs–1 irrigated; Clayey range site, 15- to 19-inch precipitation zone; windbreak suitability group 1.

Frazer silty clay loam, saline (Fr).—This soil is on flood plains, terraces, and fans in irrigated areas. Slopes are 0 to 2 percent on the flood plains and terraces and 3 to 4 percent on the fans. The soil has a profile similar to the one described as representative of the series, but it is moderately saline affected in the upper 20 inches and has a few greenish-gray, gray, and olive-yellow mottles.

Runoff is slow, and the hazard of erosion is slight. A seasonal high water table is typically at a depth of 4 to 5 feet. This soil is used for irrigated and dryfarmed crops, hay, wildlife, recreation, and range. Capability unit IIIs–2 dryland; Saline Lowland range site, 10- to 14-inch precipitation zone; windbreak suitability group 2S.

Frazer silty clay (Fs).—This nearly level soil is on flood plains and low terraces. Slopes are 0 to 1 percent. The soil has a profile similar to the one described as representative of the series, but the surface layer is silty clay, and there are no strata of material coarser than silty clay loam below a depth of 10 inches. Also, in some places coarse fragments of gravel size are below a depth of 3 feet, and in others there are gray and olive-yellow mottles and a few salt crystals.

Runoff is slow, and the hazard of erosion is slight. Flooding occurs in places in the larger stream valleys. This soil is used for dryfarmed and irrigated crops, hay, wildlife, recreation, and range. Capability unit IIs–2 dryland, IIs–1 irrigated; Clayey range site, 15- to 19-inch precipitation zone; windbreak suitability group 1.

Frazer and Korchea soils, channeled (FT).—This undifferentiated soil group is made up of Frazer silty clay loam and Korchea loam on narrow, level valley bottoms along intermittent streams. It is on flood plains, low terraces, straight-sided stream channels, and small fans at the mouths of side drainageways. Areas are 200 to 500 feet wide and as much as 1½ miles long. The flood plains and terraces are level, and the channeled and eroded edges of fans and breaks have slopes of 15 to 35 percent. The soils in this mapping unit have profiles similar to the ones described as representative of their respective series, but they are steeper.

Runoff is medium, and the hazard of erosion is severe. Runoff actively cuts channels. In places the soils are subject to overflow, but the stream channel generally carries all the runoff. These soils are used for range, wildlife, recreation, and watershed. Capability unit VIe–1 dryland; Silty range site, 10- to 14-inch precipitation zone; windbreak suitability group 4.

Gilt Edge Series

The Gilt Edge series consists of deep, nearly level to gently sloping and undulating, well-drained, sodium-affected soils on terraces. Slopes range from 0 to 4 percent. These soils formed in alkaline alluvium. Elevation ranges from 2,900 to 3,600 feet.

The native vegetation is mainly western wheatgrass, Sandberg bluegrass, big sagebrush, needleandthread, fringed sagewort, and blue grama. Annual precipitation is 12 to 14 inches, the average annual soil temperature is 47° to 49° F, and the frost-free period is 115 to 125 days.

In a representative profile the surface layer is light brownish-gray and grayish-brown loam and silt loam about 3 inches thick. The subsoil is grayish-brown clay and silty clay about 13 inches thick. The substratum is pale-yellow silty clay and silty clay loam that extends to a depth of 60 inches or more.

Permeability is slow, and available water capacity is high. The effective rooting depth is 40 inches or more. These soils are used for dryfarmed crops, wildlife, recreation, and range. They are suitable for irrigation.

Representative profile of Gilt Edge silty clay loam, 0 to 2 percent slopes, in grassland, 660 feet north and 300 feet east of the SW. corner sec. 1, T. 3 S., R. 32 E.

A21—0 to 1 inch, light brownish-gray (10YR 6/2) loam, dark brown (10YR 4/3) moist; massive; soft, very friable, nonsticky and slightly plastic; many vesicular pores; abrupt, smooth boundary.

A22—1 inch to 3 inches, grayish-brown (10YR 5/2) silt loam, dark brown (10YR 3/3) moist; moderate, medium, platy structure; slightly hard, friable, slightly sticky and plastic; clean sand grains coating the tops of the plates are 10YR 6/2 when dry; abrupt, smooth boundary.

B21t—3 to 6 inches, grayish-brown (10YR 5/2) crushed, 5/3 ped) clay, dark grayish brown (10YR 4/2) moist; moderate, fine, prismatic structure parting to strong, fine, blocky; very hard, firm, very sticky and very plastic; moderately thick, patchy clay films on peds; few fine pores; clear, smooth boundary.

B22t—6 to 10 inches, grayish-brown (10YR 5/2 crushed, 5/3 ped) clay, dark grayish brown (10YR 4/2 crushed, 4/3 ped) moist; moderate, medium, prismatic structure parting to strong, medium, blocky; very hard, firm, very sticky and very plastic; thin, patchy clay films on peds; few fine pores; slightly effervescent; clear, smooth boundary.

B3ca—10 to 16 inches, grayish-brown (2.5Y 6/2) silty clay, light olive brown (2.5Y 5/4) moist; moderate, medium, prismatic structure parting to moderate, medium, blocky; very hard, firm, very sticky and very plastic; strongly effervescent; common medium lime masses; clear, wavy boundary.

C1—16 to 27 inches, pale-yellow (2.5Y 7/4) silty clay, light yellowish brown (2.5Y 6/4) moist; weak, coarse, prismatic structure parting to weak, coarse, blocky; very hard, firm, very sticky and very plastic; strongly effervescent; common fine lime threads and masses; gradual, wavy boundary.

C2—27 to 42 inches, pale-yellow (2.5Y 7/4) silty clay loam, light yellowish brown (2.5Y 6/4) moist; massive; very hard, friable, sticky and very plastic; strongly effervescent; gradual, wavy boundary.

C3—42 to 60 inches, pale-yellow (2.5Y 7/4) silty clay loam, light yellowish brown (2.5Y 6/4) moist; massive; very hard, friable, sticky and plastic; strongly effervescent.

The A horizon is loam, silt loam, and silty clay loam. The B2t horizon ranges from 50 to 60 percent clay and is light olive brown, grayish brown, dark grayish brown, and brown. The C horizon ranges from pale brown to pale yellow in hue of 5Y to 10YR.

Gilt Edge silty clay loam, 0 to 2 percent slopes (Gc).—This nearly level soil is on high gravelly terraces. It has the profile described as representative of the series. Included in mapping are spots of Shonkin and Hydro soils, 1 acre to 2 acres in size.

Runoff is slow, and the hazard of erosion is slight. This soil is used for irrigated and dryfarmed crops, hay, wildlife, recreation, and range. Capability unit IVs–2 dryland, IVs–1 irrigated; Dense Clay range site, 10- to 14-inch precipitation zone; windbreak suitability group 2S.

Gilt Edge silty clay loam, 2 to 4 percent slopes (Gd).—This gently sloping soil is on low ridges, knolls, and crests of broad undulations on high gravelly terraces and benches. Slopes range from 50 to 200 feet long. Shallow drainageways near the terrace edge have slopes of 3 to 4 percent. The soil has a profile similar to the one described as representative of the series, but it is steeper.

Included with this soil in mapping are small areas of Shonkin, Hesper, Keiser, and Hydro soils. Also included are small areas of soils that have gravel covering 15 to 20 percent of the surface and small areas of soils that are underlain by gravelly sand at a depth of 30 inches.

Runoff is slow, and the hazard of erosion is slight. Areas of the included Shonkin soil are subject to flooding when the snow melts in spring. This soil is used for irrigated and dryfarmed crops. hay, wildlife, recreation, and range. Capability unit IVs–2 dryland, IVe–1 irrigated; Dense Clay range site, 10- to 14-inch precipitation zone; windbreak suitability group 2S.

Gilt Edge-Bone complex, 0 to 1 percent slopes (Ge).—This complex is made up of nearly level soils on gravelly terraces and benches. It is 50 to 60 percent Gilt Edge silty clay loam, 25 to 35 percent Bone and Talag clays, and 0 to 15 percent Shonkin, Keiser, and Colby silty clay loams. The Bone and Talag soils are in microdepressions and slickspots and have a sparse, stunted plant cover. The Shonkin soil is in shallow potholes 1/8 to 1 acre in size. The Keiser and Colby soils are on slight ridges and crests of surface undulations and along terraces. The Keiser and Colby soils in this complex have profiles similar to the ones described as representative of their respective series, but they are less sloping.

Runoff is slow, and the hazard of erosion is slight. The Shonkin soil is briefly ponded when the snow melts in spring. These soils are used for irrigated and dryfarmed crops, hay, wildlife, recreation, and range. Capability unit IVs–2 dryland, IVs–1 irrigated; Pan Spots range site, 10- to 14-inch precipitation zone; windbreak suitability group 4.

Gilt Edge-Bone complex, 1 to 4 percent slopes (Gf).—This complex is made up of nearly level and gently sloping soils on gravelly terraces. It is about 40 percent Gilt Edge silty clay loam, 30 percent Bone and Talag clays, and 30 percent Shonkin, Keiser, and Colby soils. The Bone and Talag soils are in microdepressions and slickspots and have a sparse, stunted plant cover. The Shonkin soil is in shallow potholes where runoff collects. The Keiser and Colby soils are on the narrow crests of ridges and along terraces.

Runoff is slow, and the hazard of erosion is slight. These soils are used for irrigated and dryfarmed crops, hay, wildlife recreation, and range. Capability unit IVs–2 dryland, IVe–1 irrigated; Pan Spots range site, 10- to 14-inch precipitation zone; windbreak suitability group 4.

Glenberg Series

The Glenberg series consists of deep, nearly level to strongly sloping and undulating to rolling, well-drained soils on low terraces, fans, foot slopes, and flood plains. Slopes are mostly 0 to 8 percent, but they range to 15 percent. These soils formed in mixed sandy loam and loam alluvium. Elevation ranges from 2,800 to 3,500 feet.

The native vegetation is mainly bluegrass, wild rose, needleandthread, western wheatgrass, curlycup gumweed, and cheatgrass. Annual precipitation is 12 to 14 inches, the average annual soil temperature is 47° to 49° F, and the frost-free period is 120 to 125 days.

In a representative profile the surface layer is grayish-brown fine sandy loam and sandy loam about 5 inches thick. The underlying material is grayish-brown and light brownish-gray fine sandy loam, loamy sand, and silt loam that extends to a depth of 60 inches or more.

Permeability is moderately rapid, and available water capacity is moderate. The effective rooting depth is 60 inches or more. These soils are used for irrigated crops, pasture, wildlife, recreation, and watershed.

Representative profile of Glenberg fine sandy loam, 0 to 2 percent slopes, in a cultivated area, 1,320 feet

east and 1,800 feet south of the NW. corner sec. 5, T. 3 N., R. 34 E.

Ap1—0 to 2 inches, grayish-brown (2.5Y 5/2) fine sandy loam, very dark grayish brown (2.5Y 3/2) moist; weak, coarse, platy structure; slightly hard, very friable, nonsticky and slightly plastic; few fine roots; slightly effervescent; abrupt, smooth boundary.

Ap2—2 to 5 inches, grayish-brown (2.5Y 5/2) sandy loam, dark grayish brown (2.5Y 4/2) moist; moderate, very coarse, platy structure; slightly hard, very friable, nonsticky and slightly plastic; few fine roots; very fine pores; strongly effervescent; abrupt, smooth boundary.

C1—5 to 14 inches, grayish-brown (2.5Y 5/2) loamy sand, dark grayish brown (2.5Y 4/2) moist; massive; soft, very friable, nonsticky and nonplastic; few fine roots; strongly effervescent; clear, wavy boundary.

C2—14 to 22 inches, light brownish-gray (2.5Y 6/2) fine sandy loam, dark grayish brown (2.5Y 4/2) moist; massive; slightly hard, very friable, nonsticky and slightly plastic; few fine roots; strongly effervescent; clear, wavy boundary.

C3—22 to 60 inches, light brownish-gray (2.5Y 6/2) stratified fine sandy loam, loamy sand, and silt loam, dark grayish brown (2.5Y 4/2) moist; massive; slightly hard, very friable, nonsticky and slightly plastic; strongly effervescent.

The soil between depths of 10 and 40 inches is sandy loam or fine sandy loam that contains a few thin bands of silt loam and loamy sand and ranges from 10 to 18 percent clay. Hue ranges from 2.5Y to 10YR throughout.

Glenberg fine sandy loam, 0 to 2 percent slopes (Gg).—This soil is on flood plains and stream terraces. It has the profile described as representative of the series.

Included with this soil in mapping are areas of soils that in places are underlain by gravelly sand at a depth of 20 to 40 inches. These areas are indicated on the detailed soil map by a special symbol.

Runoff is slow, and the hazard of erosion is moderate. This soil is subject to spring flooding. It is used for irrigated and dryfarmed crops, hay, wildlife, recreation, and range. Capability unit IVe–3 dryland, IIs–2 irrigated; Sandy range site, 10- to 14-inch precipitation zone; windbreak suitability group 2M.

Glenberg fine sandy loam, 2 to 4 percent slopes (Gh).—This soil is on fans and terraces. Slopes are smooth and range from 300 to 500 feet long. The soil has a profile similar to the one described as representative of the series, but it is steeper.

Runoff is slow, and the hazard of erosion is moderate. This soil is used for irrigated and dryfarmed crops, hay, wildlife, recreation, and range. Capability unit IVe–3 dryland, IIe–2 irrigated; Sandy range site, 10- to 14-inch precipitation zone; windbreak suitability group 2M.

Glenberg fine sandy loam, 4 to 8 percent slopes (Gk).—This soil is on foot slopes and fans. Areas range from 10 to 30 acres in size. Slopes are 250 to 400 feet long. The soil has a profile similar to the one described as representative of the series, but it is steeper. Included in mapping are areas of Alice soils, 1 acre to 5 acres in size.

Runoff is medium, and the hazard of erosion is moderate. This soil is used for irrigated and dryfarmed crops, hay, wildlife, recreation, watershed, and range. Capability unit IVe–3 dryland, IIIe–2 irrigated; Sandy range site, 10- to 14-inch precipitation zone; windbreak suitability group 2M.

Glenberg loam, 0 to 2 percent slopes (Gm).—This soil is on flood plains and low terraces. It has a profile similar to the one described as representative of the series, but the surface layer is loam 6 to 10 inches thick.

Runoff is slow, and the hazard of erosion is moderate. The soil is subject to overflow when the snow melts in spring. It is used for dryfarmed and irrigated crops, hay, wildlife, recreation, and range. Capability unit IVe–3 dryland, IIs–2 irrigated; Silty range site, 10- to 14-inch precipitation zone; windbreak suitability group 1.

Grail Series

The Grail series consists of deep, nearly level to steep and hilly, well-drained soils on terraces and fans. Slopes range from 0 to 35 percent. These soils formed in silty clay loam and silty clay alluvium. Elevation ranges from 3,500 to 5,000 feet.

The native vegetation is mainly green needlegrass, western wheatgrass, plum, thornapple, and Sandberg bluegrass. Annual precipitation is 14 to 16 inches, the average annual soil temperature is 45° to 47° F, and the frost-free period is 100 to 115 days.

In a representative profile the surface layer is dark-grayish-brown clay loam about 8 inches thick. The subsoil is grayish-brown and light olive-gray silty clay loam and silty clay about 22 inches thick. The substratum is light-gray and pale-yellow silty clay and silty clay loam that extends to a depth of 65 inches or more.

Permeability is moderately slow, and available water capacity is moderate or high. The effective rooting depth is 60 inches or more. These soils are used for dryfarmed and irrigated crops, watershed, wildlife, recreation, and range.

Representative profile of Grail clay loam, 0 to 2 percent slopes, in a cultivated area, 1,600 feet north and 1,320 feet west of the SE. corner sec. 19, T. 7 S., R. 39 E.

Ap1—0 to 2 inches, dark grayish-brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate, thin, platy structure; hard, friable, sticky and plastic; many fine and very fine roots; abrupt, smooth boundary.

Ap2—2 to 8 inches, dark grayish-brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate, thin, platy structure; hard, firm, sticky and plastic; common very fine roots; clear, smooth boundary.

B21t—8 to 15 inches, grayish-brown (2.5Y 5/2) heavy silty clay loam, very dark grayish brown (2.5Y 3/2) moist; moderate, medium, prismatic structure parting to moderate, medium, blocky; very hard, firm, very sticky and plastic; common very fine roots; common very fine pores; moderately thick, patchy clay films on peds; clear, wavy boundary.

B22t—15 to 26 inches, grayish-brown (2.5Y 5/2) silty clay, very dark grayish brown (2.5Y 3/2) moist; weak, medium, prismatic structure parting to strong, medium and fine, blocky; very hard, very firm, very sticky and very plastic; common very fine roots; common very fine pores; moderately thick, patchy clay films on peds; clear, wavy boundary.

B3ca—26 to 30 inches, light olive-gray (5Y 6/2) silty clay,

olive (5Y 5/3) moist; weak, medium, prismatic structure parting to weak, fine and medium, blocky; hard, firm, very sticky and very plastic; few very fine roots; few very fine pores; strongly effervescent; many fine and medium, soft lime masses; gradual, wavy boundary.

C1ca—30 to 38 inches, light-gray (5Y 7/2) silty clay, olive (5Y 5/3) moist; massive; hard, firm, very sticky and very plastic; very few very fine roots; common very fine pores; strongly effervescent; many medium, soft lime masses; gradual, wavy boundary.

C2—38 to 65 inches, pale-yellow (2.5Y 7/4) heavy silty clay loam, light olive brown (2.5Y 5/4) moist; massive; hard, firm, very sticky and very plastic; common very fine pores; strongly effervescent; common fine, soft lime masses.

The A and B2t horizons range from 24 to 34 inches in combined thickness. The A horizon has hue of 10YR and 2.5Y and chroma of 2 or 1. It is clay loam or silty clay. The B2t horizon is 38 to 50 percent clay. The Cca horizon ranges from pale olive to light yellowish brown in hue of 2.5Y and 5Y. In places the lower part of the C horizon is stratified with thin lenses of silty clay loam, silt loam, and silty clay.

Grail clay loam, 0 to 2 percent slopes (Gn).—This soil is on terraces. Areas are 10 to 20 acres in size. Slopes are mostly smooth and are 1 percent or less. Locally, old meanders or channel scars are evident. The soil has the profile described as representative of the series. Included in mapping are areas of soils that have a surface layer of silty clay loam.

Runoff is slow, and the hazard of erosion is slight. In places the water table is at a depth of 4 to 5 feet in spring. This soil is used for irrigated and dryfarmed crops, hay, wildlife, recreation, and range. Capability unit IIc–2 dryland, IIs–1 irrigated; Clayey range site, 15- to 19-inch precipitation zone; windbreak suitability group 1.

Grail clay loam, 2 to 8 percent slopes (Go).—This soil is in narrow bands on fans and terraces. Slopes range from 150 to 300 feet long. Slopes are 2 percent on the terraces and 4 percent on the fans. The soil has a profile similar to the one described as representative of the series, but it is steeper. Included in mapping are areas of soils that have a surface layer of silty clay loam.

Runoff is medium, and the hazard of erosion is moderate. Most areas receive additional moisture through runoff from steeper soils above them or from tributary drainageways. This soil is used for irrigated and dryfarmed crops, hay, wildlife, recreation, watershed, and range. Capability unit IIIe–2 dryland, IIIe–1 irrigated; Clayey range site, 15- to 19-inch precipitation zone; windbreak suitability group 1.

Grail clay loam, 8 to 15 percent slopes (Gr).—This soil is in small areas on valley sides and at the heads of major valleys. In places it is in a band above less steep Grail soils. Slopes are about 200 feet long and are mostly 12 to 15 percent. The soil has a profile similar to the one described as representative of the series, but it is steeper. Included in mapping are small spots of Wayden silty clay loam.

Runoff is rapid, and the hazard of erosion is moderate. This soil is used for dryfarmed crops, wildlife, recreation, watershed, range, and hay. Capability unit IVe–2 dryland; Clayey range site, 15- to 19-inch precipitation zone; windbreak suitability group 1.

Grail clay loam, 15 to 35 percent slopes (GS).—This soil is between a series of sharp ridges that form the divides between major drainageways. Small drainageways have cut through the areas at right angles to the ridges. The soil has a profile similar to the one described as representative of the series, but it is steeper. The native vegetation is thornapple, mountain maple, and snowberry.

Included with this soil in mapping are Wayden soils on ridges. Also included are small areas of Regent and Savage soils.

Runoff is rapid, and the hazard of erosion is severe. This soil is used for range, watershed, recreation, and game range. Capability unit VIe–1 dryland; Thin Hilly range site, 15- to 19-inch precipitation zone; windbreak suitability group 4.

Grail silty clay, 0 to 2 percent slopes (Gt).—This soil is on terraces and fans. Areas are 15 acres in size. The soil has a profile similar to the one described as representative of the series, but the surface layer is silty clay, and the substratum has strata of red silt and silty clay loam.

Runoff is slow, and the hazard of erosion is slight. This soil is used for dryfarmed and irrigated crops, hay, wildlife, recreation, and range. Capability unit IIIe–2 dryland, IIs–1 irrigated; Clayey range site, 15- to 19-inch precipitation zone; windbreak suitability group 1.

Hanson Series

The Hanson series consists of deep, rolling and strongly sloping to very steep, well-drained soils on foot slopes below rock ledges and on limestone hills in sedimentary uplands. Slopes range from 8 to 70 percent. These soils formed in highly calcareous very gravelly loam alluvium. Elevation ranges from 6,000 to 8,500 feet.

The native vegetation is mainly dogbane, spike fescue, sedges, horizontal juniper, bluebunch wheatgrass, and Douglas-fir. Annual precipitation is 19 to 24 inches, the average annual soil temperature is 42° to 44° F, and the frost-free period is 60 to 75 days.

In a representative profile the surface layer is dark-brown gravelly loam about 11 inches thick. The underlying material is brown to very pale brown very gravelly loam that extends to a depth of 108 inches or more.

Permeability and available water capacity are moderate. The effective rooting depth is 60 inches or more. These soils are used for range, game range, watershed, woodland, and recreation.

Representative profile of Hanson gravelly loam, in an area of Hanson-Babb association, very steep, in grassland, 300 feet north and 200 feet east of the SW. corner sec. 26, T. 8 S., R. 31 E.

A11—0 to 7 inches, dark-brown (10YR 3/3) gravelly loam, very dark brown (10YR 2/2) moist; weak, very fine, granular structure; soft, friable, slightly sticky and slightly plastic; many very fine and micro and few medium roots; 30 percent (volume) angular and semiround limestone fragments of pebble and cobble size; clear, wavy boundary.

A12—7 to 11 inches, dark-brown (10YR 4/3) gravelly loam, dark brown (10YR 3/3) moist; massive; soft, friable, slightly sticky and slightly plastic; common very fine and micro and few medium roots; 40

percent (volume) limestone fragments of pebble and cobble size; slightly effervescent; thin lime coatings on the pebbles and cobbles; clear, wavy boundary.

C1ca—11 to 18 inches, brown (10YR 5/3) very gravelly loam, dark brown (10YR 4/3) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; common very fine and micro roots; 50 percent (volume) limestone fragments of pebble and cobble size; strongly effervescent; thin lime coatings and thick lime pendants on the bottoms of the pebbles and cobbles; gradual, wavy boundary.

C2ca—18 to 30 inches, pale-brown (10YR 6/3) very gravelly heavy loam, brown (10YR 5/3) moist; massive; hard, friable, sticky and plastic; common very fine and micro roots; 50 percent (volume) limestone fragments of pebble and cobble size; violently effervescent; common fine, soft lime masses and lime casts on the bottoms of the pebbles and cobbles; gradual, wavy boundary.

C3ca—30 to 108 inches, very pale brown (10YR 7/3) very gravelly loam, brown (10YR 5/3) moist; massive; soft, very friable, slightly sticky and plastic; few micro roots in upper part; 65 percent (volume) limestone fragments of pebble and cobble size; violently effervescent; lime casts on the bottoms of the pebbles and cobbles.

The soil ranges from 25 to 75 percent, by volume, coarse fragments of limestone, siltstone, and chalcedony, but they average 35 to 60 percent when mixed. The A horizon is grayish brown and brown in hue of 7.5YR to 2.5Y. The Cca horizon has a 15- to 15-percent calcium carbonate equivalent in the soil fraction less than 2 millimeters in diameter. It is pink and pale yellow.

Hanson extremely stony loam, rolling (HA).—This soil is on ridges between deep mountain valleys. Slopes are mostly 10 to 15 percent, but they range to 8 percent. The soil has a profile similar to the one described as representative of the series, but the surface is 30 to 40 percent stones and boulders as much as 2 to 3½ feet in diameter.

Runoff is slow, and the hazard of erosion is moderate. This soil is used for range, watershed, wildlife, and recreation. Capability unit VIIe–1 dryland; Silty range site, 20- to 24-inch precipitation zone; windbreak suitability group 4.

Hanson-Babb association, very steep (HB).—This association is made up of very steep Hanson gravelly loam and Babb silt loam on side slopes of steep mountain valleys and canyons. Areas are mostly 80 to 500 acres in size and on north- and east-facing slopes. Slopes are mostly more than 45 percent, but they range to 35 percent in the steep valley bottoms. In some areas there are isolated low pinnacles and discontinuous ledges of Rock outcrop. The amount of each soil in any mapped area varies with the steepness of slope and the amount of Rock outcrop. Where the rock ledges are present, the Hanson soil extends down the side slopes 200 to 400 feet and has slopes of more than 60 percent. The Babb soil is on the less steep parts of the valley bottoms and has slopes of 35 to 50 percent. The Hanson soil in this association has the profile described as representative of the Hanson series.

Runoff is slow, and the hazard of erosion is moderate. These soils are used for woodland, game range, watershed, range, and recreation. The principal tree species are Douglas-fir, Engelmann spruce, and subalpine fir. A few aspen, cottonwoods, alder, and mountain maple grow on the steep valley bottoms. The average site index for Douglas-fir is 60.

Timber harvest on these soils is limited by steep slopes and difficult access. Most of the soils are below thick rock canyon rims that bar road construction. Valley bottoms are narrow and subject to severe erosion if used for access roads. Controlling fire is a major concern of management. There are small infestations of bark beetles in the Big Horn Mountain. Capability unit VIIs–1 dryland; not placed in a range site or windbreak suitability group.

Harvey Series

The Harvey series consists of deep, gently undulating to rolling, well-drained soils on fans, benches, and terraces. Slopes range from 2 to 15 percent. These soils formed in highly calcareous alluvium. Elevation ranges from 2,900 to 4,400 feet.

The native vegetation is mainly big sagebrush, black sagebrush, bluebunch wheatgrass, prairie junegrass, and Hoods phlox. Annual precipitation is 10 to 14 inches, the average annual soil temperature is 47° to 49° F, and the frost-free period is 115 to 125 days.

In a representative profile the surface layer is pale-brown loam about 3 inches thick. The subsoil is brown loam about 4 inches thick. The substratum is pale-brown loam in the upper part and very pale brown loam and pink gravelly loam in the lower part. It extends to a depth of 50 inches or more.

Permeability and available water capacity are moderate. The effective rooting depth is 40 inches or more. These soils are used for range, wildlife, recreation, watershed, and dryfarmed and irrigated crops.

Representative profile of Harvey loam, undulating, in grassland, 660 feet south and 500 feet west of center of sec. 12, T 3 N., R. 33 E.

A—0 to 3 inches, pale-brown (10YR 6/3) loam, dark brown (10YR 3/3) moist; moderate, medium, platy structure; slightly hard, friable, slightly sticky and slightly plastic; few (1/16 inch to 1 inch in diameter) limestone and chert fragments of pebble size on the surface; clear, smooth boundary.

B—3 to 7 inches, brown (10YR 5/3) heavy loam, dark brown (10YR 4/3) moist; weak, medium, prismatic structure parting to weak, medium, blocky; hard, friable, sticky and plastic; few limestone fragments of pebble size throughout; clear, wavy boundary.

C1—7 to 12 inches, pale-brown (10YR 6/3) loam, brown (10YR 5/3) moist; weak, coarse, prismatic structure; hard, friable, sticky and plastic; strongly effervescent; hard, friable, sticky and plastic; strongly effervescent; few limestone fragments of pebble size throughout; clear, wavy boundary.

C2ca—12 to 23 inches, very pale brown (10YR 7/3) heavy loam, light yellowish brown (10YR 6/4) moist; moderate, medium, subangular blocky structure; hard, friable, sticky and plastic; violently effervescent; common coarse and medium segregated lime masses; clear, wavy boundary.

C3—23 to 31 inches, very pale brown (10YR 7/3) loam, yellowish brown (10YR 5/4) moist; massive; hard, friable, sticky and plastic; 10 percent (volume) limestone fragments of pebble size; strongly effervescent; few medium segregated lime mottles; gradual, wavy boundary.

C4—31 to 43 inches, pink (7.5YR 7/3) gravelly loam, light brown (7.5YR 6/4) moist; massive; hard, friable, sticky and plastic; 30 percent (volume) limestone

fragments of pebble size; strongly effervescent; clear, irregular boundary.

C5—43 to 50 inches, pink (7.5YR 7/3) very gravelly loam, light brown (7.5YR 6/4) moist; massive; soft, very friable, nonsticky and nonplastic; 60 percent (volume) limestone fragments of gravel size; strongly effervescent.

Depth to calcareous material is 2 to 8 inches. The soil between depths of 10 and 40 inches ranges from 0 to 35 percent coarse fragments. Hue ranges from 7.5YR to 2.5Y, and chroma is 2 or 3. The A horizon is grayish-brown and brown loam and gravelly loam. The Cca horizon is light brown, light gray, and pale yellow. It has a 15- to 35-percent calcium carbonate equivalent.

Harvey loam, gently undulating (Hca).—This gently undulating soil is on terraces, benches, fans, and foothills. Areas range from 20 to 200 acres in size. Slopes are mostly 2 and 3 percent, but they range to 4 percent. The soil has a profile similar to the one described as representative of the series, but it is less sloping, in places the substratum is weak red below a depth of 20 inches, and coarse fragments of limestone are below a depth of 40 inches.

Runoff is slow, and the hazard of erosion is slight. This soil is used for irrigated and dryfarmed crops, hay, wildlife, recreation, and range. Capability unit IIIe–3 dryland, IIe–1 irrigated; Silty range site, 10- to 14-inch precipitation zone; windbreak suitability group 3L.

Harvey loam, undulating (Hcb).—This soil is on narrow, rounded ridges and low mounds separated by shallow drainageways on fans and eroded parts of old dissected terraces. Slopes are 4 to 5 percent on the ridgetops, mounds, and shallow drainageways and 6 to 8 percent on the sides of the high ridges and deep drainageways. The soil has the profile described as representative of the series.

Included with this soil in mapping are spots of Clapper gravelly loam and Toluca clay loam. The Clapper soil is on sharp ridges and the edges of deep drainageways.

Runoff is medium, and the hazard of erosion is moderate. This soil is used for dryfarmed and irrigated crops, hay, wildlife, recreation, watershed, and range. Capability unit IIIe–3 dryland, IIIe–1 irrigated; Silty range site, 10- to 14-inch precipitation zone; windbreak suitability group 3L.

Harvey loam, rolling (Hcc).—This soil is on eroded parts of benches and fans. Areas are typically small and in many places are separated by narrow drainageways. Local relief is 20 to 30 feet. Slopes are 6 to 7 percent on the wide ridges between shallow drainageways and 10 to 15 percent on narrow ridges between deep drainageways. Slopes range from 75 to 200 feet long. The soil has a profile similar to the one described as representative of the series, but it is steeper. Included in mapping are spots of Harvey gravelly loam, Colby silty clay loam, and Clapper gravelly loam.

Runoff is medium, and the hazard of erosion is severe. This soil is used mostly for range, wildlife, recreation, and watershed. A few small areas are used for dryfarmed crops and hay. Capability unit IVe–3 dryland; Silty range site, 10- to 14-inch precipitation zone; windbreak suitability group 3L.

Harvey gravelly loam, undulating (Hd).—This soil is on gravelly ridgetops and foot slopes along the mountain fronts. Areas range from 10 to 250 acres in size. Slopes are mostly 4 to 8 percent, but they range to 2 percent. The soil has a profile similar to the one described as representative of the series, but the surface layer is gravelly loam, the coarse fragments are mainly limestone, and the underlying material below a depth of 30 inches is light reddish brown or pink. Included in mapping are small spots of Stormitt soils.

Runoff is rapid, and the hazard of erosion is moderate. This soil is suited to range, wildlife, recreation, watershed, hay, and dryfarmed crops. Capability unit IIIe–3 dryland; Silty range site, 10- to 14-inch precipitation zone; windbreak suitability group 3L.

Harvey complex, undulating (He).—This complex is made up of undulating soils on remnants of old terraces or benches. It is about 45 percent Harvey gravelly loam, 45 percent Harvey loam, and 0 to 10 percent Stormitt soils and red Shale outcrop. Areas of these soils are 5- to 10-acre islands elevated 15 to 40 feet above the surface of more recent deposits. Slopes are mostly 4 to 8 percent. Harvey gravelly loam is on the higher part of the landscape and is surrounded by Harvey loam. The Stormitt soil has slopes of 8 to 10 percent and is in bands along the narrow drainageways. Its surface layer is 30 to 40 percent stones and boulders. The red Shale outcrop is in a band below the island of the original terraces. Shale outcrop has slopes of 15 to 25 percent that are 50 to 125 feet long. The Harvey soils have profiles similar to the one described as representative of the series, but the lower part of the underlying material is 30 to 40 percent coarse fragments, the surface layer is 15 to 30 percent coarse fragments, and loose very gravelly loam alluvium is at a depth of 30 to 50 inches.

Runoff is rapid, and the hazard of erosion is moderate. These soils are suited to pasture, hay, wildlife, recreation, watershed, and dryfarmed crops. Capability unit IIIe–3 dryland; Silty range site, 10- to 14-inch precipitation zone; windbreak suitability group 3L.

Haverson Series

The Haverson series consists of deep, nearly level to steep, well-drained soils on flood plains and low terraces. Slopes range from 0 to 35 percent. These soils formed in stratified loam, silt loam, and fine sandy loam alluvium. Elevation ranges from 2,800 to 3,300 feet.

The native vegetation is mainly Sandberg bluegrass, needleandthread, silver sagebrush, curlycup gumweed, and cudweed sagewort. Annual precipitation is 12 to 14 inches, the average annual soil temperature is 47° to 49° F, and the frost-free period is 115 to 125 days.

In a representative profile the surface layer is grayish-brown loam about 12 inches thick. The underlying material is light yellowish-brown and light brownish-gray stratified silt loam, loam, and sandy loam that extends to a depth of 60 inches or more.

Permeability is moderate, and available water capacity is high. The effective rooting depth is 60 inches or more. These soils are used for irrigated and dryfarmed crops, wildlife, recreation, watershed, and range.

Representative profile of Haverson loam, 0 to 2 percent slopes, in a cultivated field, 660 feet east and 300 feet south of the NW. corner sec. 20, T. 3 N., R. 34 E.

Ap1—0 to 4 inches, grayish-brown (2.5Y 5/2) heavy loam, dark grayish brown (2.5Y 4/2) moist; weak, subangular blocky structure; hard, friable, slightly sticky and plastic; slightly effervescent; clear, smooth boundary.

Ap2—4 to 12 inches, grayish-brown (2.5Y 5/2) heavy loam, dark grayish brown (2.5Y 4/2) moist; weak, subangular blocky structure; hard, friable, slightly sticky and plastic; very few very fine roots; few very fine pores; slightly effervescent; clear, smooth boundary.

C1—12 to 27 inches, light yellowish-brown (2.5Y 6/4) loam, light olive brown (2.5Y 5/4) moist; massive; hard, friable, slightly sticky and slightly plastic; few fine roots; common fine pores; strongly effervescent; gradual, wavy boundary.

C2—27 to 33 inches, light brownish-gray (2.5Y 6/2) stratified silt loam and sandy loam, light olive brown (2.5Y 5/4) moist; massive; slightly hard, friable, nonsticky and slightly plastic; very few fine roots; strongly effervescent; gradual, wavy boundary.

C3—33 to 60 inches, light yellowish-brown (2.5Y 6/4) light sandy loam, light olive brown (2.5Y 5/4) moist; few faint, reddish-brown mottles; massive; slightly hard, very friable, nonsticky and slightly plastic; slightly effervescent.

The A horizon is grayish-brown, light brownish-gray, and light yellowish-brown silty clay, silty clay loam, or loam. It ranges from 10YR to 2.5Y in hue. The C horizon is light yellowish brown, light brownish gray, and light olive gray.

Haverson loam, 0 to 2 percent slopes (Hfa).—This nearly level soil is on flood plains and low terraces. Most areas are nearly level and smooth, but in places there are scars of old stream channels. The soil has the profile described as representative of the series.

Included with this soil in mapping are small areas of soils that are underlain by gravelly sand at a depth of 20 to 40 inches. These areas are indicated on the detailed soil map by a special symbol.

Runoff is slow, and the hazard of erosion is slight. Locally, spring flooding occurs in places. Streambank erosion is a concern of management along the perennial streams. This soil is suited to dryfarmed and irrigated crops, hay, wildlife, recreation, and range. Capability unit IIIc–1 dryland, IIc–1 irrigated; Silty range site, 10- to 14-inch precipitation zone; windbreak suitability group 1.

Haverson loam, 2 to 4 percent slopes (Hfb).—This gently sloping soil is on fans. Areas are 5 to 20 acres in size. Slopes are less than 200 feet long, and they are mostly 2 percent. The soil has a profile similar to the one described as representative of the series, but it is steeper. Included in mapping are small areas of McRae loam.

Runoff is medium, and the hazard of erosion is moderate. This soil is used for irrigated and dryfarmed crops, hay, wildlife, recreation, and range. Capability unit IIIe–3 dryland, IIe–1 irrigated; Silty range site, 10- to 14-inch precipitation zone; windbreak suitability group 1.

Haverson loam, saline (Hfc).—This nearly level soil is on low terraces and flood plains, in swales, and below irrigation canals. Slopes are 0 to 2 percent. The soil has a profile similar to the one described as representative of the series, but visible salts are in the upper 12 inches, a water table is at a depth of 36 inches, and brownish-yellow and yellow mottles are below a depth of 20 inches. Kochia and inland saltgrass are the common plants on this saline-affected soil. The salt horizons are typically 12 to 18 inches thick.

Included with this soil in mapping are spots of saline-affected Glenberg sandy loam. Steep areas are indicated on the detailed soil map by spot symbols.

Runoff is slow, and the hazard of erosion is slight. This soil needs drainage and leaching before crops will grow. Without reclamation, it is used for range, hay, recreation, and wildlife. If it is drained and leached of salts and if good management is used, the soil is suited to irrigated and dryfarmed crops. Capability unit IIIs–2 dryland; Saline Lowland range site, 10- to 14-inch precipitation zone; windbreak suitability group 2S.

Haverson silty clay loam (Hfd).—This nearly level soil is on terraces and fans. Slopes are 0 to 1 percent. Areas range from 5 to 40 acres in size. The soil has a profile similar to the one described as representative of the series, but it is silty clay loam to a depth of about 12 inches and has thin strata of silty clay loam and silty clay below a depth of 20 inches.

Runoff is slow, and the hazard of erosion is slight. This soil is suited to irrigated and dryfarmed crops, hay, wildlife, recreation, and range. Capability unit IIIc–1 dryland, IIc–2 irrigated; Clayey range site, 10- to 14-inch precipitation zone; windbreak suitability group 1.

Haverson silty clay (Hfe).—This nearly level soil is on terraces and fans. It is in slack water areas and old meanders and swales where water is ponded for several days in spring. Slopes are 0 to 1 percent. Areas range from 3 to 10 acres in size. The soil has a profile similar to the one described as representative of the series, but the surface layer is silty clay 10 to 14 inches thick.

Runoff is slow, and the hazard of erosion is slight. In the swales and old meanders in places, a temporary water table is at a depth of 4 or 5 feet in spring and early in summer. This soil is suited to irrigated and dryfarmed crops, hay, wildlife, recreation, and range. Capability unit IIIe–3 dryland, IIs–1 irrigated; Clayey range site, 10- to 14-inch precipitation zone; windbreak suitability group 1.

Haverson silty clay, thick surface (Hff).—This nearly level soil is on fans and terraces, typically at the lower ends of broad fans deposited on river terraces. Slopes are 0 to 2 percent. They range from 300 to 800 feet long. The soil has a profile similar to the one described as representative of the series, but the surface layer is silty clay 18 to 24 inches thick.

Runoff is slow, and the hazard of erosion is slight. The bare soil is subject to soil blowing. This soil is suited to irrigated and dryfarmed crops, hay, wildlife, recreation, and range. Capability unit IIIe–3 dryland, IIs–1 irrigated; Clayey range site, 10- to 14-inch precipitation zone; windbreak suitability group 1.

Haverson-Hysham silty clay loams (Hfh).—This complex is made up of nearly level and gently sloping soils in stream valleys. It is 65 to 80 percent Haverson silty clay loam and 20 to 35 percent Hysham silty clay loam.

Slopes are 0 to 4 percent. Areas of the Hysham soil are 5 to 15 feet wide and are marked by surface crusting and greasewood. They typically have slopes of 1 percent, but they range to 4 percent. The Haverson and Hysham soils in this complex have profiles similar to those described as representative of their respective series, but the Haverson soil has a surface layer of silty clay loam, and the Hysham soil has a surface layer of silty clay.

Runoff is slow, and the hazard of erosion is moderate. In the large stream valleys, these soils are sometimes briefly flooded if the snow melts rapidly or after early summer rains. They are suited to range, recreation, and wildlife and to hay and dryfarmed crops. Capability unit IIIe–3 dryland; Clayey range site, 10- to 14-inch precipitation zone; windbreak suitability group 3S.

Haverson and Glenberg soils (HGa).—This undifferentiated soil group is made up of nearly level soils in river valleys. It consists of Haverson loam and silty clay loam and Glenberg fine sandy loam and loam in variable proportions. Slopes are 0 to 2 percent. The land surface is rough, and local relief is 1 foot to 3 feet. The Haverson and Glenberg soils in this mapping unit have profiles similar to the ones described as representative of their respective series, but some of the Haverson soils have a surface layer of silty clay loam, and some of the Glenberg soils have a surface layer of loam.

Included with these soils in mapping are areas of Riverwash and areas of soils that are similar to these Haverson and Glenberg soils but that are moderately deep over gravel. Proportion and extent of these included soils vary widely in areas of this mapping unit. Also included are areas of soils that have layers of gravelly sand at a depth of 20 to 40 inches.

Runoff is slow, and the hazard of erosion is severe. These soils are subject to overflow early in spring. The stream channel changes, and streambank erosion is active. The soils in old stream meanders have a water table at a depth of 3 to 5 feet. These soils are used for range, hay, wildlife, recreation, and pasture.

The principal tree species are cottonwood, aspen, willow, ash, and boxelder. The understory is wild rose, buffaloberry, snowberry, and western hawthorn. The stands are open and of mixed ages. Open grassy areas also occur. Areas suitable for irrigation require clearing and leveling. Capability unit IIIe–3 dryland; Sandy range site, 10- to 14-inch precipitation zone; windbreak suitability group 2W.

Haverson and Lohmiller soils, channeled (HGb).—This undifferentiated soil group is made up of nearly level to steep soils in stream-dissected valleys. It consists of Haverson loam and silty clay loam and Lohmiller silty clay loam. The proportion and extent of these soils vary widely, and no useful purpose would be served by mapping them separately. Channel erosion and the extreme stream meanders divide the mapped areas into 1/4- to 3-acre patches. Slopes are 0 to 4 percent on the valley bottom and 15 to 35 percent on the short terrace breaks, and the sides of the stream channels. The Haverson and Lohmiller soils in this mapping unit have profiles similar to the ones described as representative of their respective series, but they are steeper, and in places the Haverson soil has a surface layer of silty clay loam. Included in mapping are spots of Hysham silty clay loam and Haverson soils, saline.

Runoff is slow, and the hazard of erosion is severe. Locally, runoff from tributaries flood some of these soils. The soils are suited to range, wildlife, recreation, and watershed. Capability unit VIe–1 dryland; Silty range site, 10- to 14-inch precipitation zone; windbreak suitability group 4.

Haverson and Lohmiller soils, frequently flooded (HGc).—This undifferentiated soil group is made up of nearly level and gently sloping soils in stream valleys. It consists of Haverson loam and silty clay loam and Lohmiller silty clay loam. The proportion and extent of these soils vary widely, and no useful purpose would be served by mapping them separately. Slopes are 0 to 4 percent. The Haverson soil in this mapping unit has a profile similar to the one described as representative of the Haverson series, but in places the surface layer is silty clay loam.

Runoff is slow, and the hazard of erosion is severe. These soils are subject to frequent flooding. They are overflowed when the snow melts rapidly or during early summer rain. They are suited to range, wildlife, and recreation. Capability unit VIw–1 dryland; Overflow range site, 10- to 14-inch precipitation zone; windbreak suitability group 4.

Haverson and Lohmiller soils, wet (Hh).—This undifferentiated soil group is made up of nearly level soils in perennial stream valleys. It consists of Haverson loam and silty clay loam and Lohmiller silty clay loam. The proportion and extent of these soils vary widely, and no useful purpose would be served by mapping them separately, because they have very limited use. Slopes are 0 to 2 percent. The Haverson and Lohmiller soils in this mapping unit have profiles similar to the ones described as representative of their respective series, but they are wet and contain visible salts.

Runoff is slow, and the hazard of erosion is slight. The water table fluctuates between depths of 36 and 60 inches. These soils are suited to range, wildlife, and recreation. Capability unit VIw–1 dryland; Saline Lowland range site, 10- to 14-inch precipitation zone; windbreak suitability group 3W.

Haverson soils, saline (HK).—This mapping unit is made up of nearly level soils on flood plains. It consists of Haverson silty clay loam and loam and some Lohmiller silty clay loam. Slopes are 0 to 2 percent. The soils in this mapping unit have profiles similar to the ones described as representative of their respective series, but visible salts are in the upper 12 inches, yellowish-brown mottles are below a depth of 30 inches, and in places the Haverson soil has a surface layer of silty clay loam. The native vegetation is mostly inland saltgrass and kochia.

Runoff is slow, and the hazard of erosion is slight. The water table is at a depth of 3 feet or more during most of the growing season. These soils are suited to irrigated and dryfarmed crops, hay, wildlife, recreation, and range. Drainage and the leaching of soluble salts are needed before crops can be grown. Capability unit IVs–2 dryland; Saline Lowland range site, 10- to

14-inch precipitation zone; windbreak suitability group 3S.

Heldt Series

The Heldt series consists of deep, nearly level to strongly sloping, well-drained soils on fans, terraces, and foot slopes in the wide river and intermittent stream valleys. Slopes range from 0 to 15 percent. These soils formed in silty clay loam alluvium. Elevation ranges from 2,800 to 3,500 feet.

The native vegetation is mainly western wheatgrass, green needlegrass, big sagebrush, and blue grama. Annual precipitation is 12 to 14 inches, the average annual soil temperature is 47° to 49° F, and the frost-free period is 115 to 125 days.

In a representative profile the surface layer is grayish-brown silty clay loam about 4 inches thick. The subsoil is grayish-brown silty clay loam about 6 inches thick. The substratum is light yellowish-brown, light-gray, and light brownish-gray silty clay loam and clay loam that extends to a depth of 60 inches or more.

Permeability is slow, and available water capacity is high. The effective rooting depth is 60 inches or more. These soils are used for dryfarmed and irrigated crops, watershed, recreation, wildlife, and range.

Representative profile of Heldt silty clay loam, 4 to 8 percent slopes, in grassland, 450 feet west and 600 feet north of the SE. corner sec. 5, T. 1 S., R. 36 E.

A—0 to 4 inches, grayish-brown (2.5Y 5/2) light silty clay loam, dark grayish brown (2.5Y 4/2) moist; weak, fine, platy structure parting to weak, fine, granular; hard, friable, slightly sticky and plastic; slightly effervescent; clear, smooth boundary.

B2—4 to 10 inches, grayish-brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; weak, medium, prismatic structure parting to moderate, medium, blocky; hard, friable, sticky and plastic; slightly effervescent; clear, wavy boundary.

C1—10 to 15 inches, light yellowish-brown (2.5Y 6/4) silty clay loam, light olive brown (2.5Y 5/4) moist; weak, medium, prismatic structure parting to weak, coarse and medium, blocky; hard, friable, sticky and plastic; strongly effervescent; few lime threads; clear, wavy boundary.

C2—15 to 23 inches, light yellowish-brown (2.5Y 6/4) silty clay loam, light olive brown (2.5Y 5/4) moist; weak, medium, blocky structure; hard, friable, sticky and plastic; strongly effervescent; common lime threads; gradual, wavy boundary.

C3—23 to 44 inches, light-gray (2.5Y 7/2) silty clay loam, grayish brown (2.5Y 5/2) moist; massive; hard, friable, sticky and plastic; strongly effervescent; gradual boundary.

C4—44 to 60 inches, light brownish-gray (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) moist; massive; hard, friable, sticky and plastic; strongly effervescent.

The soil between depths of 10 and 40 inches is heavy silty clay loam or silty clay. Coarse fragments, shale, and gravel range from 0 to 5 percent throughout, and hue is 2.5Y to 5Y. The A horizon is light brownish gray, grayish brown, and olive gray. The Cca horizon is light gray and pale olive.

Heldt silty clay loam, 0 to 2 percent slopes (HIa).—This soil is in small areas on terraces and fans. It has a profile similar to the one described as representative of the series, but it is less sloping.

Runoff is slow, and the hazard of erosion is slight. This soil is suited to most irrigated and dryfarmed crops, hay, wildlife, recreation, and range. Capability unit IIIs–3 dryland, IIs–1 irrigated; Clayey range site, 10- to 14-inch precipitation zone; windbreak suitability group 1.

Heldt silty clay loam, 2 to 4 percent slopes (HIb).—This soil is on long foot slopes and fans. Slopes range from 300 to 600 feet long. The soil has a profile similar to the one described as representative of the series, but it is less sloping and has a few pebbles on the surface in areas near gravel-capped hills.

Included with this soil in mapping are small areas of soils that have a substratum of clay or silty clay below a depth of 4 feet or dark-colored material below a depth of 30 inches. Also included are small spots of Lohmiller silty clay loam and McRae loam. These included soils make up as much as 25 percent of the total area of this mapping unit.

Runoff is medium, and the hazard of erosion is moderate. This soil is suited to most irrigated and dryfarmed crops, hay, wildlife, recreation, and range. Capability unit IIIe–3 dryland, IIe–1 irrigated; Clayey range site, 10- to 14-inch precipitation zone; windbreak suitability group 1.

Heldt silty clay loam, 4 to 8 percent slopes (HIc).—This soil is on foot slopes and fans and below areas of Shale outcrop. In places pebbles are scattered on the surface. Slopes are generally smooth, but deep gullies, 500 to 800 feet apart, occur in some areas. The soil has the profile described as representative of the series. Included in mapping are isolated 1- to 2-acre knobs of Midway silty clay loam and Lohmiller silty clay loam.

Runoff is rapid, and the hazard of erosion is moderate. This soil is suited to most irrigated and dryfarmed crops, hay, wildlife, recreation, watershed, and range. Capability unit IIIe–3 dryland, IIIe–1 irrigated; Clayey range site, 10- to 14-inch precipitation zone; windbreak suitability group 1.

Heldt silty clay loam, 8 to 15 percent slopes (HId).—This soil is in long, narrow areas on foot slopes along intermittent streams. Slopes are mostly 10 to 15 percent, and they range from 150 to 400 feet long. The soil has a profile similar to the one described as representative of the series, but it is steeper. Included in mapping is a band of Lohmiller silty clay loam below areas of Shale outcrop.

Runoff is rapid, and the hazard of erosion is severe. Most areas of this soil receive runoff from steeper soils above them. The soil is suited to dryfarmed crops, hay, wildlife, recreation, watershed, and range. Capability unit IVe–3 dryland; Clayey range site, 10- to 14-inch precipitation zone; windbreak suitability group 1.

Heldt silty clay, 0 to 2 percent slopes (HIe).—This soil is on large fans. Slopes are mostly 1 percent or less, and they range from 400 to 800 feet long. The soil has a profile similar to the one described as representative of the series, but the surface layer is silty clay 12 inches thick.

Runoff is slow, and the hazard of erosion is slight. This soil is suited to irrigated crops, recreation, wildlife, hay, and range. Capability unit IIs–1 irrigated; Clayey range site, 10- to 14-inch precipitation zone; windbreak suitability group 1.

Heldt-Hysham silty clay loams, 0 to 2 percent slopes (HIf).—This complex is made up of nearly level soils on

fans and low terraces and in intermittent stream valleys. It is about 70 percent Heldt silty clay loam and 25 percent Hysham silty clay loam. Slopes are mostly 0 to 1 percent. The Hysham soil is in the light-gray slickspots, which have a crusted surface and are nearly barren of vegetation.

Included with these soils in mapping are small areas of Hydro loam and Allentine silty clay that make up 5 to 10 percent of the area of this mapping unit.

Runoff is slow, and the hazard of erosion is slight. These soils are suited to range, hay, wildlife, recreation, and dryfarmed crops. Capability unit IIIs–3 dryland; Clayey range site, 10- to 14-inch precipitation zone; windbreak suitability group 3S.

Heldt-Hysham silty clay loams, 2 to 4 percent slopes (Hlg).—This soil is made up of gently sloping soils on fans and low terraces and in intermittent stream valleys. It is about 75 percent Heldt silty clay loam and 25 percent Hysham silty clay loam. Slopes are mostly 2 percent on the valley bottoms and 3 or 4 percent on the fans and valley sides. The Hysham soil is in spots about 15 feet wide where the vegetation is thin and the light-gray surface layer is crusted.

Runoff is medium, and the hazard of erosion is moderate. These soils are suited to range, hay, wildlife, recreation, and dryfarmed crops. Capability unit IIIe–3 dryland; Clayey range site, 10- to 14-inch precipitation zone; windbreak suitability group 3S.

Hesper Series

The Hesper series consists of deep, nearly level to gently sloping, well-drained soils on terraces in the sedimentary uplands. Slopes range from 0 to 8 percent. These soils formed in calcareous, wind- and water-transported silt and very fine sand. Elevation ranges from 3,100 to 3,600 feet.

The native vegetation is mainly needleandthread, blue grama, big sagebrush, and western wheatgrass. Annual precipitation is 13 to 14 inches, the average annual soil temperature is 47° to 49° F, and the frost-free period is 110 to 120 days.

In a representative profile the surface layer is light brownish-gray silty clay loam about 6 inches thick. The subsoil is brown and light olive-brown silty clay about 16 inches thick. The substratum is light brownish-gray silty clay loam to a depth of about 49 inches. Very gravelly sand extends to a depth of 60 inches or more.

Permeability is moderately slow, and available water capacity is moderate. The effective rooting depth is 50 inches or more. These soils are used for dryfarmed crops, wildlife, recreation, watershed, and range. They are suitable for irrigation.

Representative profile of Hesper silty clay loam, 0 to 1 percent slopes, in hayland, 1,320 feet south and 330 feet west of the NE. corner sec. 32, T. 2 N., R. 33 E.

Ap1—0 to 2 inches, light brownish-gray (10YR 6/2) light silty clay loam, dark grayish brown (10YR 4/2) moist; moderate, thin, platy structure; hard, friable, sticky and plastic; few very fine roots; common clear sand grains on the tops of the structure plates; clear, smooth boundary.

Ap2—2 to 6 inches, light brownish-gray (10YR 6/2) silty clay loam, dark grayish brown (10YR 4/2) moist; weak, coarse, blocky structure; hard, friable, sticky and plastic; common very fine roots; many very fine pores; common clean sand grains coating peds; clear, smooth boundary.

B2t—6 to 14 inches, brown (10YR 5/3) silty clay, dark brown (10YR 3/3) moist; moderate, medium, prismatic structure parting to strong, medium and fine, blocky; very hard, firm, very sticky and very plastic; common fine roots; many very fine pores; moderately thick, patchy clay films on peds; clear, wavy boundary.

B3—14 to 22 inches, light olive-brown (2.5Y 5/4) silty clay, olive brown (2.5Y 4/4) moist; moderate, medium, prismatic structure parting to strong, fine and medium, blocky; very hard, firm, very sticky and very plastic; common very fine roots; common very fine pores; slightly effervescent; gradual, wavy boundary.

C1ca—22 to 34 inches, light brownish-gray (2.5Y 6/2) heavy silty clay loam, dark grayish brown (2.5Y 4/2) moist; weak, coarse, prismatic structure parting to moderate, medium, blocky; very hard, firm, very sticky and very plastic; few fine roots; many very fine pores; strongly effervescent; common fine lime threads; gradual, wavy boundary.

C2ca—34 to 49 inches, light brownish-gray (2.5Y 6/2) silty clay loam, grayish brown (2.5Y 5/2) moist; weak, coarse, blocky structure; very hard, friable, sticky and plastic; strongly effervescent; few fine, soft lime masses and common fine lime threads.

IIC—49 to 60 inches, very gravelly sand.

Hue is 10YR to 2.5Y throughout. The A horizon is light brownish gray, grayish brown, or pale brown. The B2t horizon is dark brown and brown. It is 35 to 50 percent clay. The Cca horizon is light gray and light brownish gray. Very gravelly sand is below a depth of 40 inches.

Hesper silty clay loam, 0 to 1 percent slopes (Hma).—This soil is on high terraces and benches. A few pebbles are scattered on the surface near shallow drainageways. The soil has the profile described as representative of the series. Included in mapping are small areas of Bew silty clay loam and Keiser silty clay loam.

Runoff is slow, and the hazard of erosion is slight. This soil is suited to irrigated and dryfarmed crops, hay, wildlife, recreation, and range. Capability unit IIIc–1 dryland, IIc–2 irrigated; Clayey range site, 10- to 14-inch precipitation zone; windbreak suitability group 1.

Hesper silty clay loam, 1 to 4 percent slopes (Hmb).—This soil is on high terraces and fans. It has a profile similar to the one described as representative of the series, but it is steeper. Included in mapping are spots of Keiser silty clay loam.

Runoff is slow, and the hazard of erosion is moderate. This soil is suited to irrigated and dryfarmed crops, hay, wildlife, recreation, and range. Capability unit IIIe–3 dryland, IIe–1 irrigated: Clayey range site, 10- to 14- inch precipitation zone; windbreak suitability group 1.

Hesper silty clay loam, 4 to 8 percent slopes (Hmc).—This soil is on high terraces and fans. Slopes are short and range from 6 to 8 percent on the terraces. They are long and smooth and are 4 or 5 percent on the fans. The soil has a profile similar to the one described as representative of the series, but it is steeper. Included in mapping are spots of Keiser silty clay loam.

Runoff is medium, and the hazard of erosion is moderate. This soil is suited to irrigated and dryfarmed crops, hay, wildlife, recreation, watershed, and range. Capability unit IIIe–3 dryland, IIIe–1 irrigated; Clayey

range site, 10- to 14-inch precipitation zone; windbreak suitability group 1.

Hydro Series

The Hydro series consists of deep, nearly level to gently sloping well-drained soils on terraces, fans, and benches. Slopes range from 0 to 8 percent. These soils formed in clay loam and silty clay loam alluvium that contains a moderate amount of sodium. Elevation ranges from 3,000 to 3,800 feet.

The native vegetation is mainly western wheatgrass, blue grama, Sandberg bluegrass, big sagebrush, and plains reedgrass. Annual precipitation is 13 to 15 inches, the average annual soil temperature is 47° to 49° F, and the frost-free period is 110 to 120 days.

In a representative profile the surface layer is light brownish-gray very fine sandy loam about 2 inches thick. The subsurface layer is brown loam about 3 inches thick. The subsoil is brown, grayish-brown, and light brownish-gray silty clay and silty clay loam about 22 inches thick. The substratum is light brownish-gray, olive-gray, and light olive-gray silty clay loam, silty clay, silt loam, and very fine sandy loam that extends to a depth of 65 inches or more.

Permeability is slow, and available water capacity is moderate or high. The effective rooting depth is 60 inches or more. These soils are used for dryfarmed crops, wildlife, recreation, watershed, and range. They are suitable for irrigation.

Representative profile of Hydro loam, 0 to 8 percent slopes, in grassland, 1,320 feet south and 1,980 feet east of the NW. corner sec. 13, T. 1 N., R. 35 E.

A2—0 to 2 inches, light brownish-gray (10YR 6/2) very fine sandy loam, very dark grayish brown (10YR 3/2) moist; moderate, thin, platy structure; slightly hard, very friable, nonsticky and slightly plastic; abundant clean sand grains; clear, smooth boundary.

A&B—2 to 5 inches, brown (10YR 5/3) loam, dark brown (10YR 3/3) moist; weak, medium, prismatic structure parting to moderate, thin, platy; slightly hard, friable, slightly sticky and slightly plastic; clean sand grains coating the tops of the plates; clear, smooth boundary.

B&A—5 to 7 inches, brown (10YR 5/3) silty clay loam, dark brown (10YR 3/3) moist; moderate, medium, prismatic structure breaking to moderate, medium, platy; hard, friable, sticky and plastic; clean sand grains coating the tops of the plates; thin, patchy clay films on peds; clear, wavy boundary.

B21t—7 to 12 inches, grayish-brown (2.5Y 4/2) silty clay, dark grayish brown (2.5Y 4/2) moist; moderate, medium, prismatic structure parting to strong, fine and medium, blocky; very hard, firm, very sticky and very plastic; moderately thick, patchy clay films on peds; clear, wavy boundary.

B22t—12 to 15 inches, grayish-brown (2.5Y 5/2) silty clay, olive brown (2.5Y 4/4) moist; moderate, medium, prismatic structure parting to strong, fine, blocky; very hard, firm, very sticky and very plastic; moderately thick, patchy clay films on peds; clear, wavy boundary.

B23t—15 to 21 inches, grayish-brown (2.5Y 5/2) silty clay, olive brown (2.5Y 4/4) moist; moderate, medium, prismatic structure parting to strong, fine, blocky; very hard, firm, very sticky and very plastic; moderately thick, patchy clay films on peds; slightly effervescent; clear, wavy boundary.

B3ca—21 to 27 inches, light brownish-gray (2.5Y 6/2) silty clay, light olive brown (2.5Y 5/4) moist; moderate, medium, prismatic structure parting to moderate, fine, blocky; very hard, firm, very sticky and very plastic; strongly effervescent; few fine lime mottles; gradual, wavy boundary.

C1ca—27 to 32 inches, light brownish-gray (2.5Y 6/2) silty clay, grayish brown (2.5Y 5/2) moist; weak, medium, blocky structure; very hard, firm, very sticky and very plastic; strongly effervescent; few medium lime mottles; gradual, wavy boundary.

C2—32 to 39 inches, olive-gray (5Y 5/2) silty clay loam, olive (5Y 4/3) moist; massive; very hard, firm, sticky and plastic; strongly effervescent; gradual boundary.

IIC—39 to 65 inches, light olive-gray (5Y 6/2) stratified silt loam and very fine sandy loam, olive gray (5Y 4/2) moist; soft, friable, slightly sticky and slightly plastic; strongly effervescent.

Hue ranges from 7.5YR to 2.5Y throughout. The noncalcareous part of the solum ranges from 12 to 18 inches in thickness. The A2 horizon is grayish-brown to light-gray very fine sandy loam to silt loam. The content of clay in the B2t horizon ranges from 45 to 55 percent. This horizon is dark brown and brown. The Cca horizon is light olive brown and light olive gray.

Hydro loam, 0 to 8 percent slopes (Hna).—This nearly level to gently sloping soil is in 5- to 35-acre areas on fans, foot slopes, and terraces. Slopes range from 300 to 600 feet long. Slopes are 0 to 2 percent on the terraces, 2 to 5 percent on the fans, and 5 to 8 percent on the foot slopes. The soil has the profile described as representative of the series. Included in mapping are small areas of Allentine silty clay.

Runoff is slow to medium, and the hazard of erosion is slight to moderate. This soil is suited to dryfarmed crops, hay, wildlife, recreation, watershed, and range. Capability unit IIIc–1 dryland; Silty range site, 10- to 14-inch precipitation zone; windbreak suitability group 2S.

Hydro silt loam, 0 to 2 percent slopes (Hnb).—This nearly level soil is on terraces, fans, and loess-mantled hills. Areas range from 5 to 20 acres in size. The soil has a profile similar to the one described as representative of the series, but the surface layer is grayish-brown silt loam. Included in mapping are small areas of Allentine silty clay.

Runoff is slow, and the hazard of erosion is slight. This soil is suited to dryfarmed and irrigated crops, hay, wildlife, recreation, and range. Capability unit IIIc–1 dryland, IIs–1 irrigated; Silty range site, 10- to 14-inch precipitation zone; windbreak suitability group 2S.

Hydro silt loam, 2 to 4 percent slopes (Hnc).—This gently sloping soil is on fans and loess-mantled hills. The soil has a profile similar to the one described as representative of the series, but the surface layer is grayish-brown silt loam. Included in mapping are areas of Richfield silty clay loam.

Runoff is medium, and the hazard of erosion is moderate. This soil is suited to irrigated and dryfarmed crops, hay, wildlife, recreation, and range. Capability unit IIIe–2 dryland, IIe–1 irrigated; Silty range site, 10- to 14-inch precipitation zone; windbreak suitability group 2S.

Hydro silt loam, 4 to 8 percent slopes (Hnd).—This gently sloping soil is in small areas on fans, terraces, and loess-mantled hills. The soil has a profile similar to the one described as representative of the series, but

the surface layer is grayish-brown silt loam. Included in mapping are spots of Richfield and Beauvais soils.

Runoff is medium, and the hazard of erosion is moderate. This soil is suited to dryfarmed crops, wildlife, recreation, watershed, and range. Capability unit IIIe–2 dryland; Silty range site, 10- to 14-inch precipitation zone; windbreak suitability group 2S.

Hydro silty clay loam, 0 to 2 percent slopes (Hne).—This nearly level soil is on loess-mantled, high gravelly terraces and benches. Most areas are cultivated, and the uniform light brownish-gray dry surface color is broken only by grayish-brown spots of included Gilt Edge and Bew soils. The soil has a profile similar to the one described as representative of the series, but the surface layer is silty clay loam that is underlain by gravelly loam and sand at a depth of 50 to 60 inches. Included in mapping is Shonkin silt loam in small depressions.

Runoff is slow, and the hazard of erosion is slight. This soil is suited to irrigated and dryfarmed crops, hay, wildlife, recreation, and range. Capability unit IIIs–3 dryland, IIs–1 irrigated; Silty range site, 10- to 14-inch precipitation zone; windbreak suitability group 2S.

Hydro silty clay loam, 2 to 4 percent slopes (Hnf).—This gently sloping soil is on foot slopes, fans, and wide, sloping ridges. The soil has a profile similar to the one described as representative of the series, but the surface layer is silty clay loam and in places shale bedrock is in the substratum above a depth of 40 inches. Locally, the soil has the reddish-gray and dark-red color of the soils on the burned shale hills. Included in mapping are small areas of Allentine soils.

Runoff is medium, and the hazard of erosion is slight. This soil is suited to dryfarmed and irrigated crops, hay, wildlife, recreation, and range. Capability unit IIIe–3 dryland, IIe–1 irrigated; Clayey range site, 10- to 14-inch precipitation zone; windbreak suitability group 2S.

Hydro-Allentine complex, 1 to 4 percent slopes (Hng).—This complex is made up of nearly level and gently sloping soils on fans and terraces. It is 60 to 80 percent Hydro loam and 20 to 40 percent Allentine silty clay. The Allentine soil has a thin cover of grass or, in plowed fields has a cover of hard clods. Where the soils have not been plowed, the Allentine soil is in microdepressions. Included in mapping are a few spots of Bone clay.

Runoff is slow, and the hazard of erosion is slight. These soils are suited to wildlife, recreation, range, and hay. They are also suited to dryfarmed crops in areas that are not more than 20 percent Allentine soil. Capability unit IVs–2 dryland; Pan Spots range site, 10- to 14-inch precipitation zone; windbreak suitability group 3S.

Hydro-Allentine complex, 4 to 8 percent slopes (Hnh).—This complex is made up of sloping soils on fans and terraces. It is about 75 percent Hydro loam and 25 percent Allentine clay loam. The Allentine soil has a thin cover of grass and is in microdepressions. In cultivated fields the Allentine soil has hard surface clods.

Runoff is medium, and the hazard of erosion is moderate. These soils are suited to dryfarmed crops, hay, wildlife, recreation, watershed, and range. Most cultivated areas need protection against runoff from soils above them. Capability unit IVs–2 dryland; Pan Spots range site, 10- to 14-inch precipitation zone; windbreak suitability group 3S.

Hydro-Gilt Edge complex, 0 to 1 percent slopes (Hnk).—This complex is made up of nearly level soils on loess-mantled gravelly terraces. It is about 40 percent Hydro loam, 40 percent Gilt Edge silty clay loam, and 20 percent Keiser silty clay loam, Shonkin loam, and Bew silty clay loam. In cultivated areas the contrasting colors of the dry soils helps to identify them. The light brownish-gray Hydro soil is level and has slow surface runoff. The grayish-brown Gilt Edge soil is on the higher parts of the landscape. The light-gray Shonkin soil is in shallow depressions. The Hydro and Gilt Edge soils in this complex have profiles similar to those described as representative of their respective series, but a few pebbles are on the surface.

Runoff water usually floods the Shonkin soil early in spring. Runoff is slow, and the hazard of erosion is slight. Nearly all of this complex is used for dryfarmed crops. These soils are also suited to range, wildlife, and recreation. Capability unit IIIs–3 dryland; Clayey range site, 10- to 14-inch precipitation zone; windbreak suitability group 2S.

Hysham Series

The Hysham series consists of deep, nearly level to strongly sloping, well-drained, sodium-affected soils on terraces, fans, and foot slopes. Slopes range from 0 to 15 percent. These soils formed in mixed loam, silt loam, and silty clay loam alluvium. Elevation ranges from 2,850 to 3,600 feet.

The native vegetation is mainly plains pricklypear, greasewood, silver sagebrush, western wheatgrass, and Sandberg bluegrass. Annual precipitation is 13 to 14 inches, the average annual soil temperature is 47° to 50° F, and the frost-free period is 115 to 125 days.

In a representative profile the surface layer is grayish-brown silt loam about 1 inch thick. The underlying material is grayish-brown and light olive-brown silty clay loam that extends to a depth of 63 inches or more.

Permeability is slow, and available water capacity is high. The effective rooting depth is 60 inches or more. These soils are used for wildlife, recreation, watershed, range, and irrigated crops.

Representative profile of Hysham silty clay loam, 4 to 8 percent slopes, in grassland, 100 feet east and 75 feet south of the center of sec. 9, T. 1 S., R. 32 E.

A—0 to 1 inch, grayish-brown (2.5Y 5/2) heavy silt loam, very dark grayish brown (2.5Y 3/2) moist; moderate, thin, platy structure; slightly hard, friable, slightly sticky and plastic; slightly effervescent; clear boundary.

C1—1 inch to 7 inches, grayish-brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate, subangular blocky structure; hard, firm, sticky and plastic; strongly effervescent; gradual boundary.

C2—7 to 11 inches, grayish-brown (2.5Y 5/2) heavy silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate, medium, subangular blocky structure;

very hard, firm, sticky and very plastic; strongly effervescent; gradual, wavy boundary.

C3—11 to 14 inches, grayish-brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; weak, fine, subangular blocky structure; hard, friable, slightly sticky and plastic; strongly effervescent; few fine salt threads and crystals; gradual, wavy boundary.

C4—14 to 23 inches, grayish-brown (2.5Y 5/2) heavy silty clay loam, dark grayish brown (2.5Y 4/2) moist; weak, fine, subangular blocky structure; very hard, firm, sticky and plastic; strongly effervescent; common fine salt crystals; gradual, wavy boundary.

C5—23 to 43 inches, grayish-brown (2.5Y 5/2) heavy silty clay loam, dark grayish brown (2.5Y 4/2) moist; weak, fine, subangular blocky structure parting to weak, medium, platy; very hard, firm, sticky and plastic; strongly effervescent; common fine salt crystals; gradual boundary.

C6—43 to 63 inches, light olive-brown (2.5Y 5/4) silty clay loam, olive brown (2.5Y 4/4) moist; massive; hard, friable, sticky and plastic; strongly effervescent; few fine salt crystals.

Hue ranges from 2.5Y to 5Y throughout. The soil between depths of 10 and 40 inches is loam, clay loam, or silty clay loam. The Ap horizon ranges from grayish brown to olive gray. The C horizon is grayish brown, light yellowish brown, light olive brown, and pale olive.

Hysham loam, 0 to 2 percent slopes (Ho).—This soil is on terraces and fans. It has a profile similar to the one described as representative of the series, but it is steeper and has a surface layer of loam.

Included with this soil in mapping are spots of Haverson loam that make up as much as 25 percent of the area of this mapping unit. Also included are areas of soils that are similar to this Hysham soil but that have a water table below a depth of 3 feet during part of the growing season.

Runoff is slow, and the hazard of erosion is slight. This soil is suited to wildlife, recreation, and range. After reclamation by drainage and leaching, it is suited to alkali-tolerant crops. Capability unit VIs–1 dryland; Silty range site, 10- to 14-inch precipitation zone; windbreak suitability group 3S.

Hysham silty clay loam, 4 to 8 percent slopes (Hp).—This soil is on foot slopes and fans and in intermittent stream valleys. It has the profile described as representative of the series. Included in mapping are spots of Lohmiller silty clay loam.

Runoff is medium, and the hazard of erosion is moderate. This soil is used for range, wildlife, recreation, and watershed. Capability unit VIe–1 dryland; Clayey range site, 10- to 14-inch precipitation zone; windbreak suitability group 3S.

Hysham silty clay loam, channeled, 0 to 4 percent slopes (Hr).—This soil is in long, narrow areas of intermittent streams. The areas are strongly dissected by shallow to deep channels. Slopes are mostly less than 1 percent, but they range to 3 or 4 percent. The soil has a profile similar to the one described as representative of the series, but the substratum in places has strata of clay loam and silty clay.

Runoff is slow, and the hazard of erosion is moderate. Some flooding occurs where the stream channel is less than 5 feet deep. This soil is suited to range, wildlife, and recreation. Capability unit VIs–1 dryland; Clayey range site, 10- to 14-inch precipitation zone; windbreak suitability group 3S.

Hysham-Midway silty clay loams, 4 to 15 percent slopes (HS).—This complex is made up of gently sloping and strongly sloping soils in wide, intermittent stream valleys. It is about 60 percent Hysham silty clay loam, 25 percent Midway silty clay loam, and 15 percent eroded edges and bottoms of the stream channels. The soils are in the bottoms and on the sides of valleys below the bordering shale and gravel hills. Hysham silty clay loam is in the valleys and on the lower valley sides between ridges and knolls of Midway silty clay loam. The Midway soil has slopes of mostly 12 to 15 percent. Included in mapping are small areas of Havre loam.

Runoff is medium, and the hazard of erosion is moderate. These soils are used for range, wildlife, recreation, and watershed. Capability unit VIe–1 dryland; Clayey range site, 10- to 14-inch precipitation zone; windbreak suitability group 3S.

Hysham and Lohmiller silty clay loams, 0 to 8 percent slopes (HT).—This association is in intermittent stream valleys on narrow terraces and small fans. It consists of Hysham silty clay loam and Lohmiller silty clay loam, and the amount of each soil varies widely. Meandering channels have cut the soils into ½- to 5-acre, irregularly shaped areas. The Hysham soil has a crusted surface and a cover of greasewood. The Hysham and Lohmiller soils in this association have profiles similar to the ones described as representative of their respective series, but the Hysham soil is less sloping and the Lohmiller soil is steeper.

Runoff is slow, and the hazard of erosion is moderate. These soils are suited to range and wildlife. Capability unit VIe–1 dryland; Overflow range site, 10- to 14-inch precipitation zone; windbreak suitability group 3S.

Judith Series

The Judith series consists of deep, nearly level to steep and gently undulating to hilly, well-drained soils on high terraces and fans. Slopes range from 0 to 35 percent. These soils formed in calcareous loam and clay loam alluvium over thick beds of loam-filled gravel. Elevation ranges from 3,600 to 4,500 feet.

The native vegetation is mainly green needlegrass, Sandberg bluegrass, silver sagebrush, coneflower, white loco, and prairie junegrass. Annual precipitation is 14 to 17 inches, the average annual soil temperature is 45° to 47° F, and the frost-free period is 90 to 115 days.

In a representative profile the surface layer is dark grayish-brown clay loam about 2 inches thick. The subsoil is grayish-brown clay loam about 6 inches thick. The substratum is pale-brown, light-gray, and white loam and gravelly loam that grades to very gravelly loam below a depth of 30 inches and that extends to a depth of 54 inches or more.

Permeability and available water capacity are moderate. The effective rooting depth is 40 inches or more. These soils are used for dryfarmed and irrigated crops, wildlife, recreation, watershed, and range.

Representative profile of Judith clay loam, 0 to 2 percent slopes, in grassland, 990 feet west of the center of sec. 13, T. 5 S., R. 28 E.

A1—0 to 2 inches, dark grayish-brown (10YR 4/2) light clay loam, very dark grayish brown (10YR 3/2) moist; moderate, thin, platy structure; hard, friable, slightly sticky and slightly plastic; many fine and very fine roots; clear, smooth boundary.

B2—2 to 8 inches, grayish-brown (10YR 5/2) light clay loam, very dark grayish brown (10YR 3/2) moist; moderate, medium, prismatic structure parting to moderate, fine, blocky; hard, firm, sticky and plastic; common micro roots; few very fine pores; clear, wavy boundary.

C1—8 to 12 inches, pale-brown (10YR 6/3) loam, brown (10YR 5/3) moist; moderate, weak, prismatic structure parting to weak, medium and fine, blocky; hard, friable, sticky and plastic; common very fine roots; common very fine pores; strongly effervescent; few fine, soft lime masses; gradual, wavy boundary.

C2ca—12 to 17 inches, light-gray (10YR 7/2) heavy loam, light brownish gray (10YR 6/2) moist; moderate, fine and medium, blocky structure; hard, friable, sticky and plastic; common very fine roots; common very fine pores; strongly effervescent; common fine, soft lime masses; gradual, wavy boundary.

C3ca—17 to 25 inches, white (10YR 8/2) heavy loam, very pale brown (10YR 7/3) moist; massive; hard, friable, slightly sticky and plastic; few very fine roots; common very fine pores; violently effervescent; diffuse, wavy boundary.

C4ca—25 to 31 inches, white (10YR 8/2) gravelly loam, pale brown (10YR 6/3) moist; massive; hard, friable, slightly sticky and plastic; violently effervescent; 25 percent (volume) fragments of pebble size; thin lime casts on pebbles; diffuse, wavy boundary.

C5—31 to 54 inches, light-gray (10YR 7/2) very gravelly loam, grayish brown (10YR 5/2) moist; loose, friable, sticky and plastic; strongly effervescent; 60 percent (volume) fragments of pebble size; lime casts on pebbles.

Hue ranges from 10YR to 7.5YR throughout. The soil between depths of 10 and 40 inches, on a weighted average, is 20 to 35 percent clay and 15 to 30 percent limestone and quartzite fragments of pebble size. The A horizon is dark grayish brown, grayish brown, and brown. The Cca horizon is white, light gray, light brownish gray, pink, very pale brown, and pale yellow. It has a 15- to 35-percent calcium carbonate equivalent.

Judith clay loam, 0 to 2 percent slopes (Jc).—This nearly level soil is on gravel benches and terraces. Slopes are mostly less than 1 percent. The soil has the profile described as representative of the series. Included in mapping are areas of soils that have a gravelly substratum at a depth of 36 inches.

Runoff is slow, and the hazard of erosion is slight. This soil is used for irrigated and dryfarmed crops, hay, wildlife, recreation, and range. Capability unit IIs–2 dryland, IIc–1 irrigated; Clayey range site, 15- to 19-inch precipitation zone; windbreak suitability group 2L.

Judith clay loam, 2 to 4 percent slopes (Jd).—This gently sloping soil is on gravel benches and terraces. It has a profile similar to the one described as representative of the series, but it is steeper. Included in mapping are small knobs and narrow ridges of Windham gravelly loam.

Runoff is medium, and the hazard of erosion is moderate. This soil is used for irrigated and dryfarmed crops, hay, wildlife, recreation, and range. Capability unit IIe–2 dryland, IIe–1 irrigated; Clayey range site, 15- to 19-inch precipitation zone; windbreak suitability group 2L.

Judith clay loam, 4 to 8 percent slopes (Je).—This gently sloping soil is on high gravel benches. Slopes are mostly 6 to 8 percent, and they range from 50 to 250 feet long. The soil has a profile similar to the one described as representative of the series, but it is steeper. Included in mapping are spots of Windham gravelly loam.

Runoff is medium, and the hazard of erosion is moderate. This soil is suited to irrigated and dryfarmed crops, hay, wildlife, recreation, watershed, and range. Capability unit IIIe–2 dryland, IIIe–1 irrigated; Clayey range site, 15- to 19-inch precipitation zone; windbreak suitability group 2L.

Judith-Windham complex, 4 to 8 percent slopes (Jh).—This complex is made up of gently sloping soils on gravel-capped benches. It is about 65 percent Judith clay loam and 35 percent Windham gravelly and cobbly loam. The Judith soil is on gravel-free areas between shallow drainageways. The Windham soils are on the edges of benches, along drainageways, and in areas where surface pebbles and cobbles are numerous. The Judith and Windham soils in this complex have profiles similar to the ones described as representative of their respective series, but they are steeper. In cultivated fields the Windham soils are light gray. Included in mapping are small areas of Savage silty clay loam.

Runoff is medium, and the hazard of erosion is moderate. These soils are suited to dryfarmed crops, hay, wildlife, recreation, watershed, and range. The surface cobbles and low crop yields on the Windham soils are a concern of management if the soils are cultivated. Capability unit IIIe–2 dryland; Clayey range site, 15- to 19-inch precipitation zone; windbreak suitability group 3L.

Judith-Windham complex, 8 to 15 percent slopes (Jk).—This complex is made up of strongly sloping soils on fans and benches. It is 40 to 60 percent Judith cobbly silt loam and 25 to 40 percent Windham cobbly loam. The Judith soil is on smooth, convex slopes. The Windham soil is in bands along benches, fans, and deep drainageways and on sharp, narrow ridges between drainageways. Coarse fragments of gravel and cobble size cover 10 to 15 percent of the Judith soil and 10 to 20 percent of the Windham soil. The Judith and Windham soils in this complex have profiles similar to the ones described as representative of their respective series, but the Judith soil has a surface layer of cobbly silt loam, and the Windham soil, of cobbly loam. Included in mapping are small spots of Danvers silty clay loam.

Runoff is rapid, and the hazard of erosion is moderate. These soils are suited to wildlife, recreation, watershed, range, hay, and dryfarmed crops. Capability unit IVe–2 dryland; Clayey range site, 15- to 19-inch precipitation zone; windbreak suitability group 3L.

Keiser Series

The Keiser series consists of deep, nearly level to gently sloping and undulating, well-drained soils on high terraces, benches, and fans. Slopes range from 0 to 8 percent. These soils formed in calcareous al-

luvium and wind-deposited silt. Elevation ranges from 3,000 to 3,600 feet.

The native vegetation is mainly needleandthread, big sagebrush, western wheatgrass, and blue grama. Annual precipitation is 13 to 14 inches, the average annual soil temperature is 47° to 49° F, and the frost-free period is 115 to 125 days.

In a representative profile the surface layer is light brownish-gray loam about 1 inch thick. The subsoil is brown, dark-brown, light yellowish-brown, and light brownish-gray loam and silty clay loam about 20 inches thick. The substratum is light brownish-gray and grayish-brown silt loam that extends to a depth of 60 inches or more.

Permeability is moderately slow, and available water capacity is high. The effective rooting depth is 60 inches or more. These soils are used for dryfarmed and irrigated crops, wildlife, recreation, watershed, and range.

Representative profile of Keiser silty clay loam, 2 to 4 percent slopes, in grassland, 660 feet south and 600 feet west of the center of sec. 16, T. 1 S., R. 33 E.

A—0 to 1 inch, grayish-brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; weak, coarse, platy structure parting to weak, medium, granular; slightly hard, very friable, nonsticky and slightly plastic; abrupt, smooth boundary.

B1—1 inch to 3 inches, brown (10YR 5/3) loam, dark brown (10YR 3/3) moist; moderate, medium, platy structure; slightly hard, friable, slightly sticky and slightly plastic; clear, smooth boundary.

B21t—3 to 7 inches, dark-brown (10YR 4/3) silty clay loam, very dark grayish brown (10YR 3/2) moist; moderate, medium, prismatic structure parting to strong, fine and medium, blocky; hard, firm, sticky and very plastic; common medium and fine pores; moderately thick, patchy clay films on peds; clear, wavy boundary.

B22t—7 to 10 inches, light yellowish-brown (2.5Y 6/4) silty clay loam, light olive brown (2.5Y 5/4) moist; moderate, medium, prismatic structure parting to moderate, medium, blocky; hard, friable, sticky and plastic; thin, patchy clay films on peds; slightly effervescent; clear, wavy boundary.

B3ca—10 to 21 inches, light brownish-gray (2.5Y 6/2) silty clay loam, light olive brown (2.5Y 5/4) moist; moderate, coarse, prismatic structure parting to moderate, coarse, blocky; hard, friable, slightly sticky and plastic; strongly effervescent; common medium lime masses; gradual boundary.

C1ca—21 to 26 inches, light brownish-gray (2.5Y 6/2) silt loam, light olive brown (2.5Y 5/4) moist; weak, coarse, blocky structure; hard, friable, slightly sticky and slightly plastic; strongly effervescent; gradual boundary.

C2—26 to 39 inches, light brownish-gray (2.5Y 6/2) silt loam, olive brown (2.5Y 4/4) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; strongly effervescent; gradual boundary.

C3—39 to 60 inches, grayish-brown (2.5Y 5/2) coarse silt loam, dark grayish brown (2.5Y 4/2) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; slightly effervescent.

Depth to calcareous material ranges from 7 to 10 inches. Hue is 10YR to 2.5Y throughout. The soil is 0 to 5 percent coarse fragments throughout. The B2t horizon is brown, light yellowish brown, light olive brown, and dark grayish brown. The Cca horizon is pale brown, light brownish gray, light olive brown, olive brown, and light yellowish brown. It has a calcium carbonate equivalent of 7 to 15 percent.

Keiser silty clay loam, 0 to 2 percent slopes (Kc).—This nearly level soil is on terraces, fans, and silt-mantled hills. Areas are 20 to 60 acres in size. The soil has a profile similar to the one described as representative of the series, but it is less sloping.

Included with this soil in mapping are small areas of Shonkin loam and Hesper silty clay loam. Also included, along deep drainageways that cut through the terrace edge, is a band, 100 to 300 feet wide, of soils that are underlain by gravelly sand at a depth of 20 to 36 inches.

Runoff is slow, and the hazard of erosion is slight. This soil is suited to dryfarmed and irrigated crops, hay, wildlife, recreation, and range. Capability unit IIIc–1 dryland, IIc–1 irrigated; Clayey range site, 10- to 14-inch precipitation zone; windbreak suitability group 1.

Keiser silty clay loam, 2 to 4 percent slopes (Kd).—This gently sloping soil is on terraces, fans, and silt-mantled hills. Slopes are mostly 2 percent, but they are 3 or 4 percent in shallow drainageways. The soil has the profile described as representative of the series. Included in mapping are areas of Shonkin loam in shallow swales and depressions.

Runoff is medium, and the hazard of erosion is moderate. This soil is suited to irrigated and dryfarmed crops, hay, wildlife, recreation, and range. Capability unit IIIe–3 dryland, IIe–1 irrigated; Clayey range site, 10- to 14-inch precipitation zone; windbreak suitability group 1.

Keiser silty clay loam, 4 to 8 percent slopes (Ke).—This gently sloping soil is on foot slopes, fans, and eroded terrace edges. The areas on foot slopes and fans are smooth and have only shallow drainageways. The terrace edges are deeply dissected by many drainageways. The soil has a profile similar to the one described as representative of the series, but it is steeper.

Included with this soil in mapping are small areas where the surface layer is clay loam or gravelly loam and areas where the substratum is violently effervescent.

Runoff is medium, and the hazard of erosion is moderate. This soil is suited to irrigated and dryfarmed crops, hay, wildlife, recreation, watershed, and range. Capability unit IIIe–3 dryland, IIIe–1 irrigated; Clayey range site, 10- to 14-inch precipitation zone; windbreak suitability group 1.

Keiser-Colby complex, gently undulating (Kf).—This complex is made up of gently undulating soils on gravel terraces. It is 45 to 60 percent Keiser silty clay loam, 25 to 40 percent Colby loam, and 10 to 20 percent Bone clay loam. Slopes are 1 to 4 percent. The Keiser soil has smooth slopes, and the Colby soil is on narrow ridgetops and on the sides of shallow drainageways. The Bone soil is in and around barren panspots where surface drainage is slow. In plowed fields the Colby soil is lighter colored than the Keiser soil, and the Bone soil has a cloddy surface.

Runoff is slow, and the hazard of erosion is slight. These soils are suited to dryfarmed crops, hay, wildlife, recreation, and range. Capability unit IIIe–3 dryland; Clayey range site, 10- to 14-inch precipitation zone; windbreak suitability group 1.

Kim Series

The Kim series consists of deep, gently sloping and strongly sloping, well-drained soils on terraces and fans. Slopes range from 4 to 15 percent. These soils formed in calcareous, mixed loam, silt loam, and fine sandy loam alluvium. Elevation ranges from 2,900 to 3,500 feet.

The native vegetation is mainly bluebunch wheatgrass, big sagebrush, blue grama, and broom snakeweed. Annual precipitation is 13 to 14 inches, the average annual soil temperature is 48° to 50° F, and the frost-free period is 115 to 125 days.

In a representative profile the surface layer is grayish-brown loam about 4 inches thick. The underlying material is light brownish-gray and light yellowish-brown loam and silt loam that extends to a depth of 65 inches or more.

Permeability is moderate, and available water capacity is high. The effective rooting depth is 60 inches or more. These soils are used for range, wildlife, recreation, watershed, and dryfarmed crops.

Representative profile of Kim loam, 4 to 15 percent slopes, in grassland, 1,020 feet north and 100 feet east of the SW. corner sec. 12, T. 1 N., R. 30 E.

A1—0 to 4 inches, grayish-brown (2.5Y 5/2) loam, very dark grayish brown (2.5Y 3/2) moist; weak, very thin, platy structure; soft, friable slightly sticky and slightly plastic; common fine roots; slightly effervescent; clear, wavy boundary.

C1—4 to 13 inches, light brownish-gray (2.5Y 6/2) heavy loam, olive brown (2.5Y 4/4) moist; hard, friable, sticky and plastic; common very fine roots; common fine pores; strongly effervescent; few indistinct, soft lime masses; gradual, wavy boundary.

C2—13 to 23 inches, light yellowish-brown (2.5Y 6/4) heavy loam, olive brown (2.5Y 4/4) moist; weak, very coarse, prismatic structure; hard, friable, sticky and slightly plastic; common fine roots; common very fine pores; strongly effervescent; few indistinct, soft lime masses; gradual, wavy boundary.

C3—23 to 33 inches, light brownish-gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; weak, coarse, blocky structure; hard, friable, slightly sticky and slightly plastic; few fine roots; common very fine pores; strongly effervescent; few fine, soft lime masses; diffuse boundary.

C4—33 to 65 inches, light brownish-gray (2.5Y 6/2) silt loam, grayish brown (2.5Y 5/2) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few fine pores; strongly effervescent.

The soil between depths of 10 and 40 inches is typically loam, coarse silt loam, or light clay loam. Hue ranges from 7.5YR to 5Y throughout. The A horizon is grayish brown and olive gray. The C horizon ranges from light yellowish brown to pale olive.

Kim loam, 4 to 15 percent slopes (Kg).—This soil is on the eroding edges of fans, terraces, and foot slopes. Areas are long, narrow, and irregularly shaped. They follow the contours of gullies and coulees that dissect the fans and terraces. Included in mapping are areas of eroded soils that have lost their original surface layer.

Runoff is rapid, and the hazard of erosion is severe. This soil is suited to watershed, recreation, wildlife, hay, pasture, and range. All areas receive runoff from soils above them. Capability unit IVe–3 dryland; Silty range site, 10- to 14-inch precipitation zone; windbreak suitability group 1.

Korchea Series

The Korchea series consists of deep, nearly level to steep, well-drained soils on flood plains and low terraces and fans. Slopes range from 0 to 35 percent. These soils formed in stratified, calcareous loam, silt loam, and sandy loam alluvium. Elevation ranges from 3,300 to 4,300 feet.

The native vegetation is mainly western wheatgrass, Sandberg bluegrass, silver sagebrush, and basin wildrye. Annual precipitation is 14 to 17 inches, the average annual soil temperature is 45° to 47° F, and the frost-free period is 105 to 115 days.

In a representative profile the surface layer is grayish-brown loam about 9 inches thick. The underlying material is light brownish-gray and light yellowish-brown loam, silt loam, and loamy sand that extends to a depth of 72 inches or more.

Permeability is moderate, and available water capacity is high. The effective rooting depth is 60 inches or more. These soils are used for irrigated and dryfarmed crops, wildlife, recreation, watershed, and range.

Representative profile of Korchea loam, 0 to 2 percent slopes, in abandoned cropland, 850 feet south and 2,240 feet east of the NE. corner sec. 4, T. 5 S., R. 35 E.

Ap—0 to 9 inches, grayish-brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; weak, subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common fine roots; slightly effervescent; abrupt, smooth boundary.

C1—9 to 18 inches, light brownish-gray (10YR 6/2) loam that has several 1– to 2–inch bands of loamy sand, dark grayish brown (10YR 4/2) moist; weak, coarse, prismatic structure; hard, friable, slightly sticky and slightly plastic; few fine roots; common fine pores; slightly effervescent; clear, wavy boundary.

C2—18 to 27 inches, light brownish-gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; weak, coarse, prismatic structure; hard, friable, slightly sticky and plastic; common very fine pores; very few fine salt crystals; slightly effervescent; clear, wavy boundary.

C3—27 to 37 inches, light brownish-gray (2.5Y 6/2) heavy silt loam, dark grayish brown (2.5Y 4/2) moist; massive; hard, friable, sticky and plastic; common fine pores; few fine threads and crystals of salts; slightly effervescent; clear, wavy boundary.

C4—37 to 51 inches, light brownish-gray (2.5Y 6/2) stratified silt loam and loamy sand, dark grayish brown (2.5Y 4/2) moist; massive; hard, friable, slightly sticky and slightly plastic; slightly effervescent; abrupt, wavy boundary.

C5—51 to 72 inches, light yellowish-brown (2.5Y 6/4) silt loam, olive brown (2.5Y 4/4) moist; thin bands of brownish-yellow mottles; massive; slightly hard, friable, nonsticky and slightly plastic; few fine pores; slightly effervescent.

Hue ranges from 2.5Y to 7.5YR throughout. The soil between depths of 10 and 40 inches has an average texture of loam but in places contains thin strata of loamy sand and silty clay. The A horizon ranges from dark grayish-brown to brown loam, silt loam, and silty clay loam. The C horizon is light brownish gray, light yellowish brown, light brown, and pale brown.

Korchea loam, 0 to 2 percent slopes (Kh).—This nearly level soil is on low terraces and flood plains that are dissected by shallow channels. Areas are 2 to 20

acres in size. The soil has the profile described as representative of the series. Some brownish-yellow and gray mottles and a few salt crystals are below a depth of 20 inches along flowing streams.

Runoff is slow, and the hazard of erosion is slight. Areas of this soil on flood plains are subject to overflow 1 year out of 4. The soil is suited to irrigated and dryfarmed crops, hay, recreation, and range. Brush- and tree-covered areas along streams are suited to wildlife. Capability unit IIc–2 dryland, IIc–1 irrigated; Silty range site, 15- to 19-inch precipitation zone; windbreak suitability group 1.

Korchea loam, 2 to 4 percent slopes (Kk).—This gently sloping soil is on fans. Areas are 3 to 10 acres in size. The soil has a profile similar to the described as representative of the series, but it is steeper. Included in mapping are small spots of Farnuf loam.

Runoff is medium, and the hazard of erosion is moderate. This soil is suited to irrigated and dryfarmed crops, hay, wildlife, recreation, and range. Capability unit IIe–2 dryland, IIe–1 irrigated; Silty range site, 15- to 19-inch precipitation zone; windbreak suitability group 1.

Korchea silt loam, 0 to 2 percent slopes (Km).—This nearly level and gently sloping soil is on small fans and low terraces. It has a profile similar to the one described as representative of the series, but the upper 12 inches is silt loam and the underlying material contains fewer sandy layers.

Included with this soil in mapping are areas of soils along stream channels. These soils are subject to occasional flooding in spring.

Runoff is slow, and the hazard of erosion is slight. This soil is suited to irrigated and dryfarmed crops, hay, wildlife, recreation, and range. Capability unit IIc–2 dryland, IIc–1 irrigated; Silty range site, 15- to 19-inch precipitation zone; windbreak suitability group 1.

Korchea silt loam, frequently flooded (Kn).—This nearly level and gently sloping soil is on small and irregularly shaped flood plains. Slopes are mostly 0 to 4 percent. The wider parts of the valley are dissected by several channels. The soil is flooded at least once each year. Some wet spots occur in old channels or oxbows. In places the water table is at a depth of 5 feet. The soil has a profile similar to the one described as representative of the series, but the surface layer is silty clay loam, the underlying material is silt loam, and there are wet spots.

Runoff is slow, and the hazard of erosion is severe. This soil is suited to range, wildlife, and recreation. Capability unit VIw–1 dryland; Overflow range site, 15- to 19-inch precipitation zone; windbreak suitability group 4.

Korchea silty clay loam, 0 to 2 percent slopes (Ko).—This nearly level soil is on terraces that are 5 to 15 feet above the river flood plain. Areas are 5 to 30 acres in size. The soil has a profile similar to the one described as representative of the series, but the surface layer is silty clay loam about 8 inches thick.

Runoff is slow, and the hazard of erosion is slight. In places the water table is below a depth of 4 feet late in spring and early in summer. This soil is suited to irrigated and dryfarmed crops, hay, wildlife, recreation, and range. Capability unit IIc–2 dryland, IIc–1 irrigated; Silty range site, 15- to 19-inch precipitation zone; windbreak suitability group 1.

Korchea silty clay loam, 2 to 4 percent slopes (Kp).—This gently sloping soil is on fans and terraces. Areas range from 5 to 60 acres in size. Slopes are smooth and range from 200 to 500 feet long. The soil has a profile similar to the one described as representative of the series, but the surface layer is silty clay loam 6 to 10 inches thick.

Runoff is medium, and the hazard of erosion is moderate. This soil is suited to irrigated and dryfarmed crops, hay, wildlife, recreation, and range. Capability unit IIe–2 dryland, IIe–1 irrigated; Silty range site, 15- to 19-inch precipitation zone; windbreak suitability group 1.

Korchea and Frazer soils, water table (KR).—This undifferentiated soil group is made up of nearly level and gently sloping soils in stream bottoms. Slopes are 1 to 4 percent. The soils are intermixed; proportion and extent of the major soils are variable. They have profiles similar to the ones described as representative of their respective series, but they have a water table at a depth of 40 to 60 inches during the growing season and the texture of the surface layer is variable. Also, in a few places the lower part of the underlying material is reddish brown or light red.

Runoff is slow, and the hazard of streambank erosion is moderate. Overflow occurs 1 year out of 3. These soils are suited to range, pasture, recreation, and wildlife. Capability unit IVw–2 dryland; Overflow range site, 15- to 19-inch precipitation zone; windbreak suitability group 2W.

Kyle Series

The Kyle series consists of deep, nearly level to strongly sloping, well-drained soils on fans and foot slopes. Slopes range from 0 to 15 percent. These soils formed in clay alluvium. Elevation ranges from 3,000 to 3,800 feet.

The native vegetation is mainly green needlegrass, western wheatgrass, big sagebrush, and wooly indianwheat. Annual precipitation is 13 to 14 inches, the average annual soil temperature is 47° to 49° F, and the frost-free period is 110 to 125 days.

In a representative profile the surface layer is grayish-brown silty clay about 2 inches thick. The subsoil is grayish-brown and olive-gray clay and silty clay about 8 inches thick. The underlying material is light olive-gray, olive, and pale-olive clay that extends to a depth of 62 inches or more.

Permeability is very slow, and available water capacity is moderate or high. The effective rooting depth is 60 inches or more. These soils are used for irrigated and dryfarmed crops, wildlife, recreation, watershed, and range.

Representative profile of Kyle silty clay, 2 to 4 percent slopes, in grassland, 200 feet south and 100 feet west of the NE. corner sec. 12, T. 2 S., R. 30 E.

A—0 to 2 inches, grayish-brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; strong, very fine, granular structure; very hard, firm, very sticky and very plastic; many fine roots; clear, smooth boundary.

B1—2 to 5 inches, grayish-brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; strong, fine, blocky structure; very hard, firm, very sticky and very plastic; common fine roots; slightly effervescent; clear, smooth boundary.

B2—5 to 10 inches, olive-gray (5Y 5/2) clay, olive gray (5Y 4/2) moist; moderate, medium, blocky structure; extremely hard, very firm, very sticky and very plastic; few fine roots and pores; strongly effervescent; gradual, wavy boundary.

C1—10 to 22 inches, light olive-gray (5Y 5/2) clay, olive (5Y 4/3) moist; moderate, coarse and medium, blocky structure; extremely hard, very firm, very sticky and extremely plastic; few fine roots; strongly effervescent; very few fine, soft lime masses; clear, wavy boundary.

C2—22 to 29 inches, olive (5Y 5/3) clay, olive (5Y 4/3) moist; moderate, coarse, blocky structure; extremely hard, very firm, very sticky and extremely plastic; common fine roots; few slickensides; strongly effervescent; few medium, soft lime masses; clear, wavy boundary.

C3cs—29 to 39 inches, olive (5Y 5/3) clay, olive (5Y 4/3) moist; weak, coarse, blocky structure; extremely hard, very firm, very sticky and very plastic; very few fine roots; few slickensides; few medium gypsum crystals; strongly effervescent; gradual, wavy boundary.

C4—39 to 62 inches, pale-olive (5Y 6/3) clay, olive (5Y 5/3) moist; massive; very hard, very firm, very sticky and very plastic; strongly effervescent; few gypsum crystals.

The solum ranges from 10 to 13 inches in thickness. If the soil is dry, cracks ½ inch to 1½ inches wide and several feet long extend downward. The soil between depths of 10 and 40 inches range from 50 to 60 percent clay. Below a depth of 40 inches, the soil in places is clay loam or silty clay loam. Coarse fragments are typically absent but in places range to as much as 10 percent. Hue is 2.5Y and 5Y throughout. The A horizon is grayish brown, olive gray, light olive gray, and light brownish gray. The B horizon is olive gray, dark grayish brown, light brownish gray, and light olive brown.

Kyle silty clay, 0 to 2 percent slopes (Ks).—This nearly level soil is on terraces and fans. Areas range from 5 to 300 acres in size. The soil has a profile similar to the one described as representative of the series, but it is less sloping. Included in mapping are small areas of Kyle clay, saline, and Vananda clay.

Runoff is slow, and the hazard of soil blowing is moderate on the bare soil. This soil is suited to irrigated and dryfarmed crops, hay, wildlife, recreation, and range. Capability unit IIIe–3 dryland, IIIs–1 irrigated; Clayey range site, 10- to 14-inch precipitation zone; windbreak suitability group 1.

Kyle silty clay, 2 to 4 percent slopes (Kt).—This gently sloping soil is on fans and terraces. Areas are 5 to 60 acres in size. Slopes are smooth, and they range from 250 to 700 feet long. The soil has the profile described as representative of the series.

Included with this soil in mapping are spots of Vananda clay and Allentine clay. In cultivated areas the gray surface layer is puddled and cloddy.

Runoff is medium, and the hazard of erosion is moderate. This soil is suited to irrigated and dryfarmed crops, hay, wildlife, recreation, and range. Capability unit IIIe–3 dryland, IIIe–3 irrigated; Clayey range site, 10- to 14-inch precipitation zone; windbreak suitability group 1.

Kyle silty clay, 4 to 8 percent slopes (Ku).—This sloping soil is on fans and foot slopes. Areas range from 10 to 30 acres in size. Slopes range from 150 to 300 feet long. The soil has a profile similar to the one described as representative of the series, but it is steeper. Included in mapping are small spots of Vananda clay.

Runoff is rapid, and the hazard of erosion is moderate. Most areas receive runoff from the hills and ridges above them. This soil is suited to dryfarmed crops, hay, wildlife, recreation, watershed, and range. Capability unit IIIe–3 dryland; Clayey range site, 10- to 14-inch precipitation zone; windbreak suitability group 1.

Kyle gravelly silty clay, 8 to 15 percent slopes (KV).—This strongly sloping soil is on dissected fans and terraces in the clay shale uplands. It has a profile similar to the one described as representative of the series, but coarse fragments of gravel and cobble size are on the surface and throughout the soil. Coarse fragments range from 10 to 35 percent in the profile and 5 to 30 percent on the surface.

Included with this soil in mapping are patches of Kyle clay, Pierre clay, Allentine clay, and Heldt silty clay loam.

Runoff is rapid, and the hazard of erosion is moderate. This soil is suited to watershed, wildlife, recreation, range, and hay. Some of the least gravelly areas are suited to dryfarmed crops. Capability unit IVe–3 dryland; Clayey range site, 10- to 14-inch precipitation zone: windbreak suitability group 1.

Kyle clay, saline (Kw).—This nearly level soil is on low terraces. Slopes are 0 to 2 percent. The soil has a profile similar to the one described as representative of the series, but it has visible salts in the upper 12 inches, a water table at or below a depth of 40 inches during the growing season, and brownish-yellow mottles in the underlying material. Effect of salinity is estimated to be moderate.

Runoff is slow, and the hazard of erosion is slight. This soil is suited to irrigated and dryfarmed crops only after reclamation. It is also suited to wildlife, recreation, range, and hay. Capability unit IVw–2 dryland; Saline Lowland range site, 10- to 14-inch precipitation zone; windbreak suitability group 3S.

La Fonda Series

The La Fonda series consists of deep, gently sloping, well-drained, reddish-colored soils on fans and foot slopes. Slopes range from 2 to 4 percent. These soils formed in loam alluvium washed from red sedimentary shale and sandstone. Elevation ranges from 4,000 to 4,500 feet.

The native vegetation is mainly silver sagebrush, black sagebrush, prairie junegrass, broom snakeweed, and needleandthread. Annual precipitation is 11 to 13 inches, the average annual soil temperature is 47° to 50° F, and the frost-free period is 105 to 115 days.

In a representative profile the surface layer is reddish-brown very fine sandy loam and silt loam about 4 inches thick. The subsoil is reddish-brown loam about 8 inches thick. The substratum is light reddish-brown and light-brown loam and silt loam that extends to a depth of 60 inches or more.

Permeability is moderate, and available water ca-

pacity is high. The effective rooting depth is 60 inches or more. These soils are used for wildlife, recreation, and range. They are suitable for dryfarmed crops.

Representative profile of La Fonda loam, 2 to 4 percent slopes, in grassland, 600 feet north and 600 feet east of the SW. corner sec. 3, T. 7 S., R. 25 E.

A11—0 to 2 inches, reddish-brown (5YR 5/3) very fine sandy loam, dark reddish brown (5YR 3/3) moist; weak, thin, platy structure; slightly hard, friable, nonsticky and slightly plastic; slightly effervescent; clear, smooth boundary.

A12—2 to 4 inches, reddish-brown (5YR 4/3) loam, dark reddish brown (5YR 3/3) moist; moderate, thin, platy structure; slightly hard, friable, slightly sticky and slightly plastic; slightly effervescent; clear, smooth boundary.

B21—4 to 8 inches, reddish-brown (5YR 4/3) loam, dark reddish brown (5YR 3/3) moist; moderate, medium, prismatic structure; hard, friable, sticky and plastic; slightly effervescent; gradual, wavy boundary.

B22—8 to 12 inches, reddish-brown (5YR 5/3) loam, reddish brown (5YR 4/3) moist; weak, medium, prismatic structure parting to moderate, medium, blocky; hard, firm, sticky and plastic; strongly effervescent; gradual, wavy boundary.

C1—12 to 19 inches, light reddish-brown (5YR 6/3) loam, reddish brown (5YR 4/3) moist; weak, medium, prismatic structure parting to moderate, medium, blocky; very hard, firm, sticky and plastic; strongly effervescent; clear, wavy boundary.

C2ca—19 to 27 inches, light reddish-brown (5YR 6/3) loam, reddish brown (5YR 4/3) moist; moderate, medium, blocky structure; very hard, firm, sticky and plastic; strongly effervescent; common fine lime mottles and a few fine lime threads; gradual, wavy boundary.

C3—27 to 41 inches, light-brown (7.5YR 6/4) loam, brown (7.5YR 5/4) moist; massive; hard, friable, slightly sticky and plastic; strongly effervescent; common lime mottles; clear, wavy boundary.

C4—41 to 60 inches, light-brown (7.5YR 6/3) silt loam, brown (7.5YR 5/4) moist; massive; hard, friable, slightly sticky and plastic; strongly effervescent; few lime mottles.

The soil ranges from 0 to 25 percent coarse fragments. Hue ranges from 2.5YR to 7.5YR throughout. The A horizon is reddish-brown, light reddish-brown, and brown silt loam, loam, or very fine sandy loam. The B2 horizon is light reddish-brown and reddish-brown to light-brown loam or silt loam. The Cca horizon is light reddish brown, light brown, and pinkish gray.

La Fonda loam, 2 to 4 percent slopes (La).—This soil is on fans and terraces in the sedimentary uplands. Included in mapping are small areas of soils that are 10 to 30 percent gravel and that have a distinct layer of lime accumulation. Also included are spots of Stormitt gravelly loam.

Runoff is medium, and the hazard of erosion is moderate. This soil is suited to recreation, wildlife, range, hay, and limited dryfarmed crops. Capability unit IIIe–3 dryland; Silty range site, 10- to 14-inch precipitation zone; windbreak suitability group 2M.

Lap Series

The Lap series consists of shallow, undulating to strongly sloping, well-drained soils on mountainsides and ridgetops in the tilted sedimentary uplands. Slopes are mostly 8 to 15 percent, but they range to 2 percent. These channery soils formed in place from limestone and hard siltstone. Elevation ranges from 3,900 to 6,000 feet.

The native vegetation is mainly Idaho fescue, Hoods phlox, bluebunch wheatgrass, and arrowleaf balsamroot. Annual precipitation is 15 to 18 inches, the average annual soil temperature is 44° to 47° F, and the frost-free period is 90 to 105 days.

In a representative profile the surface layer is grayish-brown channery loam about 4 inches thick. The underlying material is light brownish-gray and light-gray very channery loam. Hard, shattered limestone is at a depth of about 19 inches.

Permeability is moderate, and available water capacity is very low. The effective rooting zone is about 19 inches. These soils are used for range, watershed, recreation, and wildlife.

Representative profile of Lap channery loam, in an area of Lap association, undulating, in grassland, 1,200 feet west and 1,200 feet north of the SE. corner sec. 6, T. 6 S., R. 26 E.

A1—0 to 4 inches, grayish-brown (10YR 4/2) channery loam, very dark grayish brown (10YR 3/2) moist; weak, very fine, granular structure; soft, very friable, nonsticky and slightly plastic; many very fine roots; 40 percent (volume) flat limestone fragments, 1 inch to 4 inches in diameter; clear, wavy boundary.

C1—4 to 12 inches, light brownish-gray (10YR 6/2) very channery loam, dark grayish brown (10YR 4/2) moist; weak, fine, subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots; 50 percent (volume) flat limestone fragments; strongly effervescent; clear, wavy boundary.

C2ca—12 to 19 inches, light-gray (10YR 7/2) very channery heavy loam, brown (10YR 5/3) moist; massive; slightly hard, friable, sticky and plastic; few very fine roots; 65 percent (volume) flat limestone fragments; strongly effervescent; irregular boundary.

R—19 inches, hard, shattered limestone.

Depth to limestone ranges from 10 to 20 inches. The soil is loam or light clay loam that is 50 to 70 percent coarse limestone fragments of channer and flagstone size.

Lap-Trulon complex, rolling (LCa).—This complex is made up of rolling soils in the sedimentary uplands. It is 45 to 65 percent Lap channery loam, 35 to 50 percent Trulon loam, and 5 to 10 percent Rock outcrop. Slopes are mostly 8 to 15 percent, but they range to 4 percent. The Lap soil is around areas of Rock outcrop, and channers cover 15 to 25 percent of the surface. The Trulon soil has fewer surface channers and a thicker grass cover than the Lap soil. The Trulon soil in this complex has the profile described as representative of the Trulon series.

Runoff is medium, and the hazard of erosion is moderate. These soils are suited to range, wildlife, recreation, and watershed. Capability unit VIe–1 dryland; Silty range site, 15- to 19-inch precipitation zone; windbreak suitability group 3L.

Lap association, undulating (LCb).—This association is made up of undulating soils in the sedimentary highlands. It is about equal parts of Lap loam and Lap channery loam. Slopes are mostly 4 to 8 percent, but they range to 2 percent. Areas range from 20 to 100 acres in size. Surface channers and gravel range from 0 to 10 percent on the loam soil and from 10 to

30 percent on the channery soil. The Lap loam has a profile similar to the one described as representative of the Lap series, but it has only a few coarse fragments in the surface layer. The Lap channery loam has the profile described as representative of the Lap series.

Runoff is medium, and the hazard of erosion is moderate. These soils are suited to range, wildlife, recreation, and watershed. Capability unit VIs–1 dryland; Shallow range site, 15- to 19-inch precipitation zone; windbreak suitability group 3M.

Lap association, rolling (LCc).—This association is made up of rolling and hilly soils in the sedimentary highlands. It is about equal parts of Lap loam and Lap stony loam. Slopes are mostly 8 to 15 percent, but they range to 20 percent. Areas are less than 100 acres in size. Surface channers and stones cover 0 to 10 percent of the loam soil and 15 to 40 percent of the stony loam soil. These soils have profiles similar to the ones described as representative of the Lap series, but the Lap loam is less than 15 percent coarse fragments and the Lap stony loam has coarse fragments of stone size.

Runoff is medium, and the hazard of erosion is moderate. This association is suited to range, wildlife, recreation, and watershed. Capability unit VIe–1 dryland; Shallow range site, 15- to 19-inch precipitation zone; windbreak suitability group 3M.

Lap-Armington association, rolling (LCd).—This association is made up of rolling to hilly and steep soils in the sedimentary highlands. It is about 45 percent Lap channery loam, 35 percent Armington silty clay, and 20 percent Reeder loam, Grail clay loam, and Rock outcrop. Slopes are mostly 8 to 15 percent, but they range to 35 percent. The Lap channery loam is on ridges and hills, along canyon rims, and above Rock outcrop on hillsides. The Armington silty clay is in bands, several hundred feet wide, between Rock outcrop on hillsides and above the Lap soil. The Lap soil in this complex has a profile similar to the one described as representative of the lap series, but it is steeper. Scattered Douglas-fir grow on the Armington soil.

Runoff is rapid, and the hazard of erosion is severe. These soils are used for range, watershed, game range, and recreation. Capability unit VIe–1 dryland; Shallow range site, 15- to 19-inch precipitation zone; windbreak suitability group 4.

Lavina Series

The Lavina series consists of shallow, undulating, well-drained soils on hard, platy shale and fine-grained sandstone uplands. Slopes are mostly 4 to 8 percent, but they range to 2 percent. These soils formed in place from the underlying shale and sandstone. Elevation ranges from 3,500 to 4,200 feet.

The native vegetation is mainly fringed sagewort, blue grama, broom snakeweed, bluebunch wheatgrass, needleandthread, and scurfpea. Annual precipitation is 10 to 14 inches, the average annual soil temperature is 47° F, and the frost-free period is 105 to 115 days.

In a representative profile the surface layer is brown loam about 2 inches thick. The subsoil is dark grayish-brown, brown, and light brownish-gray loam and clay loam about 9 inches thick. The substratum is light-gray gravelly loam that is about 25 percent, by volume, chips of hard shale in the lower part. Hard shale and sandstone are at a depth of about 14 inches.

Permeability is slow, and available water capacity is very low. The effective rooting depth is 10 to 20 inches. These soils are used for range, wildlife, recreation, and watershed.

Representative profile of Lavina loam, in an area of Lavina-Travessilla loams undulating, 185 feet east of trail, 310 feet south and 75 feet east of the center sec. 33, T. 4 S., R. 29 E.

A1—0 to 2 inches, brown (10YR 5/2) loam, dark brown (10YR 3/2) moist; moderate, thin, platy structure; slightly hard, friable, slightly sticky and slightly plastic; few hard shale chips; clear, smooth boundary.

B1—2 to 4 inches, dark grayish-brown (10YR 4/2) loam, dark brown (10YR 3/3) moist; weak, medium, prismatic structure parting to moderate, coarse, platy; hard, friable, sticky and plastic; few hard shale chips; clear, smooth boundary.

B2t—4 to 8 inches, brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; weak, medium, prismatic structure parting to moderate, very fine, subangular blocky; hard, firm, very sticky and plastic; thin, patchy clay films on peds; few hard shale chips; gradual, wavy boundary.

B3ca—8 to 11 inches, light brownish-gray (10YR 6/2) clay loam, brown (10YR 5/3) moist; weak, medium, prismatic structure breaking to weak, very fine, subangular blocky; hard, firm, sticky and plastic; strongly effervescent; few fine lime mottles; few hard shale chips; gradual, wavy boundary.

Cca—11 to 14 inches, light-gray (10YR 7/2) gravelly loam, pale brown (10YR 6/3) moist; weak, coarse, prismatic structure parting to weak, very fine, subangular blocky; strongly effervescent; common medium lime mottles; 25 percent (volume) hard shale chips; abrupt, wavy boundary.

R—14 to 15 inches, hard, ¼-inch to 1-inch thick, platy shale and sandstone.

Depth to bedrock ranges from 10 to 20 inches. The soil ranges from 0 to 30 percent coarse fragments of gravel and channer size. Hue is 10YR and 2.5Y. The A horizon is brown, grayish-brown, and light brownish-gray loam or sandy loam. The B2t horizon is brown, dark brown, grayish brown, and dark grayish brown and ranges from 30 to 45 percent clay. The Cca horizon is light brownish gray, light gray, and light yellowish brown. The C horizon is generally absent where depth to bedrock is less than 12 inches.

Lavina-Travessilla loams, undulating (LD).—This complex is made up of undulating soils on smooth, slightly tilted, hard limestone and shale uplands. It is 40 to 60 percent Lavina loam, 25 to 40 percent Travessilla loam, and 5 to 15 percent Travessilla channery loam, Rock outcrop, and Renohill clay loam. Slopes are mostly 4 to 8 percent, but they range to 2 percent. Slopes are 150 to 300 feet long. The Travessilla loam in this complex has a profile similar to the one described as representative of Travessilla series, but the surface layer is 5 to 15 percent flat sandstone fragments of gravel size. The Lavina soil has the profile described as representative of the Lavina series.

Runoff is medium, and the hazard of erosion is moderate. These soils are suited to range, wildlife, recreation, watershed, pasture, and dryfarmed crops. Capability unit IVs–2 dryland; Shallow range site, 10- to 14-inch precipitation zone; windbreak suitability group 3M.

Lennep Series

The Lennep series consists of deep, gently sloping and undulating, well-drained, sodium-affected soils on fans, terraces, and foot slopes in the sedimentary uplands. Slopes are mostly 2 to 8 percent, but they range to 0 percent. These soils formed in fine-textured alluvium. Elevation ranges from 3,500 to 4,300 feet.

The native vegetation is mainly western wheatgrass, green needlegrass, big sagebrush, and prairie junegrass. Annual precipitation is 14 to 16 inches, the average annual soil temperature is 45° to 47° F, and the frost-free period is 95 to 115 days.

In a representative profile the upper part of the surface layer is light brownish-gray loam about 2 inches thick. The lower part of the surface layer is grayish-brown light clay loam about 2 inches thick. The subsoil is grayish-brown, dark grayish-brown, light olive-brown, and light yellowish-brown silty clay loam and clay about 23 inches thick. The substratum is light yellowish-brown and pale-yellow silty clay and clay that extends to a depth of 73 inches or more.

Permeability is slow, and available water capacity is moderate or high. The effective rooting depth is 60 inches or more. These soils are used for dryfarmed crops, wildlife, and range. They are suitable for irrigation.

Representative profile of Lennep loam, 2 to 4 percent slopes, in grassland, 660 feet north and 2,100 feet east of the SW. corner sec. 18, T. 4 S., R. 34 E.

A2—0 to 2 inches, light brownish-gray (10YR 6/2) loam, dark grayish brown (10YR 4/2) moist; moderate, medium, platy structure; soft, friable, nonsticky and slightly plastic; many very fine roots; clean silt and sand grains coating the tops of the plates; clear, smooth boundary.

A&B—2 to 4 inches, grayish-brown (10YR 5/2) light clay loam, very dark grayish brown (10YR 3/2) moist; moderate, medium, platy structure; hard, friable, sticky and plastic; common very fine roots; many very fine pores; clean silt and sand grains coating peds; clear, wavy boundary.

B&A—4 to 8 inches, grayish-brown (10YR 5/2) heavy silty clay loam, very dark grayish brown (10YR 3/2) moist; strong, medium, prismatic structure parting to moderate, coarse, platy; hard, firm, very sticky and plastic; common very fine roots; many very fine tubular pores; thin, patchy clay films on peds coated with clean silt and sand grains; clear, smooth boundary.

B21t—8 to 12 inches, dark grayish-brown (10YR 4/2) light clay, dark brown (10YR 3/3) moist; strong, medium, prismatic structure parting to strong, medium and fine, blocky; very hard, very firm, very sticky and very plastic; few very fine roots; common very fine tubular pores; thin, continuous clay films on peds; gradual, wavy boundary.

B22t—12 to 16 inches, grayish-brown (2.5Y 5/2) clay, olive brown (2.5Y 4/4) moist; strong, coarse, prismatic structure parting to strong, coarse, blocky; extremely hard, very firm, very sticky and very plastic; few very fine roots; few very fine tubular pores; thin, continuous clay films on peds and coating rims and walls of pores; gradual, wavy boundary.

B23t—16 to 23 inches, light olive-brown (2.5Y 5/4) heavy clay, olive brown (2.5Y 4/4) moist; strong, coarse, prismatic structure parting to strong, coarse, blocky; extremely hard, extremely firm, very sticky and extremely plastic; few very fine roots; few very fine tubular pores; continuous clay films on peds; fine pores partly closed by clay flow; clear, wavy boundary.

B3cacs—23 to 27 inches, light yellowish-brown (2.5Y 6/4) clay, light olive brown (2.5Y 5/4) moist; weak, coarse, blocky structure; extremely hard, very firm, very sticky and very plastic; few very fine roots between blocks; few very fine tubular pores; slightly effervescent; many seams and threads of gypsum crystals; common masses of segregated lime; clear, wavy boundary.

C1cacs—27 to 32 inches, light yellowish-brown (2.5Y 6/4) light clay, light olive brown (2.5Y 5/4) moist; massive; very hard, very firm, very sticky and very plastic; few very fine roots; few very fine tubular pores; strongly effervescent; many seams and threads of gypsum; common masses of segregated lime; clear, wavy boundary.

C2cacs—32 to 41 inches, pale-yellow (2.5Y 7/4) heavy silty clay, light yellowish brown (2.5Y 6/4) moist; massive; very hard, firm, sticky and very plastic; strongly effervescent; common gypsum crystals; common segregated lime mottles; clear, wavy boundary.

C3—41 to 73 inches, pale-yellow (2.5Y 7/4) heavy silty clay, light yellowish brown (2.5Y 6/4) moist; massive; very hard, firm, sticky and plastic; strongly effervescent; few segregated lime masses.

Hue ranges from 2.5Y to 7.5YR throughout. The A2 and B&A horizons range from 7 to 12 inches in combined thickness. The noncalcareous part of the soil ranges from 12 to 26 inches in thickness. The A2 horizon is grayish brown or light brownish gray. The A&B horizon is light to heavy silty clay loam or clay loam. The B2t horizon is 50 to 60 percent clay. It is brown, grayish brown, light olive brown, and dark grayish brown. The Cca horizon is pale-yellow or light yellowish-brown clay, silty clay, or silty clay loam.

Lennep loam, 2 to 4 percent slopes (Lea).—This soil is on fans and terraces. Areas are 10 to 15 acres in size. The soil has the profile described as representative of the series.

Included with this soil in mapping are spots of Adger clay. Also included are some areas of soils that are similar to this Lennep soil, but shale bedrock is below a depth of 36 inches.

Runoff is slow, and the hazard of erosion is slight. This soil is suited to dryfarmed crops, hay, wildlife, recreation, and range. Capability unit IIIe–2 dryland; Clayey range site, 15- to 19-inch precipitation zone; windbreak suitability group 2S.

Lennep loam, 4 to 8 percent slopes (Leb).—This soil is on fans and foot slopes. Areas are 20 to 50 acres in size. The soil has a profile similar to the one described as representative of the series, but it is steeper.

Included with this soil in mapping are spots of Adger clay. Also included are some areas of soils that are similar to this Lennep soil, but shale bedrock is below a depth of 36 inches.

Runoff is medium, and the hazard of erosion is moderate. This soil is suited to dryfarmed crops, hay, wildlife, recreation, watershed, and range. Capability unit IVe–2 dryland; Clayey range site, 15- to 19-inch precipitation zone; windbreak suitability group 2S.

Lennep-Adger complex, gently undulating (Lec).—This complex is made up of gently undulating soils on terraces and fans. It is 70 to 85 percent Lennep loam and 15 to 30 percent Adger clay. Slopes are mostly 2 to 4 percent, but they range to 0 percent. The Adger soil is in microdepressions, and in cultivated areas it has a cloddy surface layer. Included in mapping are some

areas of soils that have shale bedrock below a depth of 36 inches.

Runoff is slow, and the hazard of erosion is slight. These soils are suited to dryfarmed crops, hay, wildlife, recreation, and range. Capability unit IIIe–2 dryland; Pan Spots range site, 15- to 19-inch precipitation zone; windbreak suitability group 3S.

Lennep-Adger complex, undulating (Led).—This complex is made up of undulating soils on fans and terraces. It is 55 to 70 percent Lennep loam and 30 to 45 percent Adger clay. Slopes are 4 to 8 percent. The Adger soil is in microdepressions that are 3 to 6 inches deep. In cultivated fields the Adger soil is cloddy. Included in mapping are some areas of soils that have shale bedrock below a depth of 36 inches.

Runoff is medium, and the hazard of erosion is moderate. These soils are suited to dryfarmed crops, pasture, wildlife, recreation, watershed, and range. Capability unit IVe–2 dryland; Pan Spots range site, 15- to 19-inch precipitation zone; windbreak suitability group 3S.

Lismas Series

The Lismas series consists of shallow, undulating to hilly or steep, well-drained soils on dissected sedimentary uplands. Slopes are mostly 4 to 35 percent, but they range to 50 percent. These soils formed in place from clay shale. Elevation ranges from 3,000 to 3,800 feet.

The native vegetation is mainly western wheatgrass, Sandberg bluegrass, wild carrot, white loco, greasewood, and Hoods phlox. Annual precipitation is 12 to 14 inches, the average annual soil temperature is 47° to 50° F, and the frost-free period is 115 to 125 days.

In a representative profile the surface layer is light olive-gray clay about 1 inch thick. The underlying material is olive-gray and light olive-gray clay. Platy shale is at a depth of about 18 inches. Fine, weathered shale chips make up 10 to 30 percent of the soil material.

Permeability is very slow, and available water capacity is very low. The effective rooting depth is 10 to 20 inches. Most of these soils are used for watershed, wildlife, recreation, and range. A few areas are included with deeper soils and are used for dryfarmed crops.

Representative profile of Lismas clay, undulating, in grassland, 600 feet north and 250 feet west of the SE. corner sec. 21, T. 2 S., R. 32 E.

A—0 to 1 inch, light olive-gray (5Y 6/2) clay, olive gray (5Y 4/2) moist; strong, very fine, granular structure; slightly hard, friable, very sticky and very plastic; slightly effervescent; clear, smooth boundary.

C1—1 inch to 6 inches, olive-gray (5Y 5/2) clay, olive (5Y 4/2) moist; weak, moderate, granular structure; hard, firm, very sticky and very plastic; strongly effervescent; few weathered shale chips; clear, wavy boundary.

C2cs—6 to 13 inches, olive-gray (5Y 5/2) clay, olive gray (5Y 4/2) moist; massive; hard, firm, very sticky and very plastic; strongly effervescent; common shale chips and a few gypsum crystals; gradual, wavy boundary.

C3—13 to 18 inches, light olive-gray (5Y 6/2) clay, olive (5Y 4/3) moist; weak, platy structure; hard, firm, very sticky and very plastic; strongly effervescent; many shale chips and a few gypsum crystals; gradual, wavy boundary.

C4—18 to 24 inches, light olive-gray (5Y 6/2) platy clay shale, 1/8 to 1/4 inch thick, olive gray (5Y 4/2) moist; strongly effervescent.

Depth to shale ranges from 10 to 20 inches. Hue is 2.5Y and 5Y throughout. The soil ranges from 45 to 60 percent clay throughout.

Lismas clay, undulating (LF).—This undulating and rolling soil is on dissected sedimentary uplands. Areas extend from the valley bottom to the base of steep ridges that border the valley. Slopes are mostly 4 to 8 percent, but they range to 10 percent. This soil has the profile described as representative of the series. Included in mapping are areas of Shale outcrop and some ¼- to 1-acre patches of Vananda clay.

Runoff is rapid, and the hazard of erosion is severe. This soil is suited to range, wildlife, recreation, and watershed. Capability unit VIe–1 dryland; Shallow Clay range site, 10- to 14-inch precipitation zone; windbreak suitability group 4.

Lismas gravelly clay, rolling (LG).—This rolling soil is on the edges of dissected gravelly benches and terraces where drainageways have cut through the gravelly material into the underlying shale. The terrain consists of narrow ridges of gravelly soils separated by closely spaced coulees or drainageways. The Lismas soil is on the sides and bottoms of drainageways. Slopes are short. They are 8 to 12 percent on ridgetops, at the heads of drainageways, and in shallow coulees, and 15 to 20 percent on the sides of deep coulees and ridges. The soil has a profile similar to the one described as representative of the series, but the surface layer is gravelly. Included in mapping are patches of Clapper, Colby, and Keiser soils on ridges.

Runoff is medium, and the hazard of erosion is moderate. This soil is suited to range, wildlife, recreation, and watershed. Capability unit VIe–1 dryland; Shallow Clay range site, 10- to 14-inch precipitation zone; windbreak suitability group 3M.

Lismas gravelly clay, hilly (LH).—This hilly soil is along the edges of high gravelly terraces that are dissected deeply by coulees, exposing the dark-gray underlying shale. Areas are 80 to 300 acres in size. In places the soil is on a steep escarpment, 200 to 300 feet high, at the heads of deep drainageways below the high gravelly terrace remnants. Scattered fragments of gravel size are on the surface of all the soils below the terrace edges. The soil has a profile similar to the one described as representative of the series, but the surface layer is gravelly clay.

Included with this soil in mapping are spots of Hesper silty clay loam, Richfield silt loam, Clapper gravelly loam, and Shale outcrop. Included soils make up 10 to 30 percent of the total area of this mapping unit.

Runoff is rapid, and the hazard of erosion is severe. Runoff water carries large amounts of sediment. This soil is suited to range, wildlife, recreation, and watershed. Capability unit VIe–1 dryland; Shallow Clay range site, 10- to 14-inch precipitation zone; windbreak suitability group 4.

Lismas-Shale outcrop complex, rolling (LK).—This complex is made up of rolling to hilly and moderately

steep soils in the sedimentary uplands. It is about 75 percent Lismas clay and 10 percent Shale outcrop. Slopes are mostly 8 to 15 percent, but they range to 20 percent. The Lismas soil in this complex has a profile similar to the one described as representative of the Lismas series, but the underlying shale material has many crystals of gypsum. Included in mapping are areas of Pierre clay and Vananda clay that make up about 15 percent of the total area of this mapping unit.

Runoff is medium, and the hazard of erosion is moderate. These soils are suited to range, wildlife, recreation, and watershed. Capability unit VIe–1 dryland; Shallow Clay range site, 10- to 14-inch precipitation zone; windbreak suitability group 3M.

Lismas-Shale outcrop complex, steep (LM).—This complex is made up of moderately steep and very steep soils in the sedimentary uplands. It is 70 to 90 percent Lismas clay and 10 to 30 percent Shale outcrop. Slopes are mostly 20 to 35 percent, but they range to 75 percent. The Lismas soil is on narrow ridges, and Shale outcrop is on the lower sides of deep drainageways. The Lismas soil in this complex has a profile similar to the one described as representative of the Lismas series, but the underlying material contains many crystals of gypsum. Included in mapping are spots of Pierre clay and Vananda clay.

Runoff is rapid, and the hazard of erosion is severe. Runoff water carries large amounts of sediment. These soils are suited to range, wildlife, recreation, and watershed. Capability unit VIIe–1 dryland; Shallow Clay range site, 10- to 14-inch precipitation zone; windbreak suitability group 4.

Lismas-Vananda clays, undulating (LN).—This complex is made up of undulating soils in the sedimentary uplands. It is about 25 percent Lismas clay, 60 percent Pierre clay, and 15 percent Vananda clay. Slopes are 4 to 8 percent. The Vananda soil has a crusted surface layer and is covered with greasewood. The Lismas soil is on the crests of surface undulations and the sides of deep drainageways. The Lismas soil in this complex has a profile similar to the one described as representative of the Lismas series, but it is shallower over shale, and it contains many crystals of gypsum. Also, in plowed areas it is light olive gray.

Runoff is medium, and the hazard of erosion is moderate. These soils are suited to wildlife, recreation, watershed, range, pasture, and dryfarmed crops. Capability unit IVe–3 dryland; Shallow Clay range site, 10- to 14-inch precipitation zone; windbreak suitability group 2S.

Lohmiller Series

The Lohmiller series consists of deep, nearly level to steep and undulating, well-drained soils on flood plains, fans, and foot slopes. Slopes range from 0 to 35 percent. These soils formed in calcareous silty clay loam alluvium. Elevation ranges from 2,800 to 3,600 feet.

The native vegetation is mainly western wheatgrass, blue grama, silver sagebrush, and Sandberg bluegrass. Annual precipitation is 12 to 14 inches, the average annual soil temperature is 47° to 49° F, and the frost-free period is 115 to 125 days.

In a representative profile the surface layer is light brownish-gray silty clay loam about 12 inches thick. The underlying material is light brownish-gray, light yellowish-brown, and pale-olive stratified silty clay loam, silt loam, and silty clay that extends to a depth of 60 inches or more.

Permeability is moderately slow, and available water capacity is high. The effective rooting depth is 60 inches or more. These soils are used for irrigated and dryfarmed crops, wildlife, recreation, watershed, and range.

Representative profile of Lohmiller silty clay loam, 0 to 2 percent slopes, in a cultivated area, 1,320 feet south and 500 feet west of the NE. corner sec. 30, T. 3 N., R. 34 E.

Ap—0 to 6 inches, light brownish-gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; weak subangular blocky structure; hard, firm, sticky and plastic; few very fine roots; few very fine pores; strongly effervescent; clear, smooth boundary.

A1—6 to 12 inches, light brownish-gray (2.5Y 6/2) heavy silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate, angular blocky structure; hard, firm, very sticky and very plastic; few very fine roots; few very fine pores; strongly effervescent; clear, wavy boundary.

C1—12 to 17 inches, light brownish-gray (2.5Y 6/2) light silty clay loam, light olive brown (2.5Y 5/4) moist; massive; hard, friable, sticky and plastic; few very fine roots; few very fine pores; strongly effervescent; gradual, wavy boundary.

C2—17 to 33 inches, pale-olive (5Y 6/3) heavy silty clay loam stratified with 1-inch to 2-inch bands of heavy silt loam, olive (5Y 5/3) moist; massive; hard, friable, very sticky and very plastic; very few fine roots; common fine pores; strongly effervescent; clear, wavy boundary.

C3—33 to 60 inches, light yellowish-brown (2.5Y 6/4) light silty clay stratified with thin bands of silty clay loam, light olive brown (2.5Y 5/4) moist; massive; very hard, firm, very sticky and very plastic; few fine pores; strongly effervescent.

The soil below a depth of 30 inches ranges from 0 to 10 percent coarse fragments. Hue is 2.5Y and 5Y throughout. The Ap horizon is light brownish gray, brownish gray, or olive gray and ranges from 6 to 12 inches in thickness.

Lohmiller silty clay loam, 0 to 2 percent slopes (Lo).—This nearly level soil is in 5- to 75-acre areas on low terraces and flood plains. It has the profile described as representative of the series.

Included with this soil in mapping in small stream valleys are areas of soils that are similar to this Lohmiller soil but that have more strata of silt loam, loam, and sandy loam below a depth of 20 inches. Also included are areas of Haverson loam.

Runoff is slow, and the hazard of erosion is slight. The areas on the flood plain are subject to overflow about 1 year out of 5. This soil is suited to irrigated and dryfarmed crops, hay, wildlife, recreation, and range. Capability unit IIIe–3 dryland, IIs–1 irrigated; Clayey range site, 10- to 14-inch precipitation zone; windbreak suitability group 1.

Lohmiller silty clay loam, 2 to 4 percent slopes (Lp).—This gently sloping soil is in 5- to 30-acre areas on fans. A few areas are on flood plains where old partly filled channels, 1 foot to 3 feet deep, occur. The soil

has a profile similar to the one described as representative of the series, but it is steeper.

Runoff is medium, and the hazard of erosion is moderate. This soil is suited to irrigated and dryfarmed crops, hay, wildlife, recreation, and range. Capability unit IIIe–3 dryland, IIe–1 irrigated; Clayey range site, 10- to 14-inch precipitation zone; windbreak suitability group 1.

Lohmiller silty clay loam, 4 to 8 percent slopes (Lr). —This gently sloping soil is on fans, foot slopes, and terraces. The large fans and terraces are dissected in many places by uncrossable dry stream channels. Most areas on foot slopes receive runoff from soils above them. The soil has a profile similar to the one described as representative of the series, but it is steeper.

Runoff is rapid, and the hazard of erosion is moderate. This soil is suited to irrigated and dryfarmed crops, hay, watershed, wildlife, recreation, and range. Capability unit IIIe–3 dryland, IIIe–1 irrigated; Clayey range site, 10- to 14-inch precipitation zone; windbreak suitability group 1.

Lohmiller silty clay loam, 8 to 15 percent slopes (Ls). —This strongly sloping soil is on deeply dissected fans and foot slopes. Narrow gullies divide the soil into patches of 10 acres or less. Some residual soils are on the wide foot slopes. Between the gullies, slopes are 200 to 300 feet long and range from 4 to 8 percent. On the gully sides, slopes are 20 to 35 percent. The soil has a profile similar to the one described as representative of the series, but it is steeper. Included in mapping are spots where erosion has removed the upper 2 to 6 inches of the surface layer.

Runoff is rapid, and the hazard of erosion is severe. Gully erosion is active late in spring. This soil is suited to range, wildlife, recreation, watershed, hay, pasture, and dryfarmed crops. Capability unit IVe–3 dryland; Clayey range site, 10- to 14-inch precipitation zone; windbreak suitability group 1.

Lohmiller silty clay, saline, 0 to 2 percent slopes (Lt). —This nearly level soil is on low terraces and flood plains. It has a profile similar to the one described as representative of the series, but the surface layer is silty clay. Also, this soil is moderately affected by saline salts, visible salt crystals are in the upper 12 inches, and the water table is at a depth of 3 to 5 feet.

Runoff is slow, and the hazard of erosion is slight. This soil is suited to irrigated and dryfarmed crops after reclamation. It is used for hay, wildlife, recreation, and range. Capability unit IVs–2 dryland; Saline Lowland range site, 10- to 14-inch precipitation zone; windbreak suitability group 2S.

Lohmiller silty clay, saline, 2 to 4 percent slopes (Lu). —This gently sloping soil is on fans, typically below irrigation canals or in shallow drainageways. It has a profile similar to the one described as representative of the series, but the surface layer is silty clay. Also, visible salt crystals are in the upper 12 inches, the soil is moderately affected by saline salts, and the water table is between depths of 3 and 5 feet.

Runoff is medium, and the hazard of erosion is moderate. This soil is suited to irrigated and dryfarmed crops after reclamation. It is used for hay, wildlife, recreation, and range. Capability unit IVs–2 dryland; Saline Lowland range site, 10- to 14-inch precipitation zone; windbreak suitability group 2S.

Lohmiller-Midway silty clay loams, undulating (LV). —This complex is made up of undulating and rolling soils on shale hills. It is about 75 percent Lohmiller silty clay loam and 25 percent Midway silty clay loam. Slopes are mostly 4 to 8 percent, but they range to 15 percent. The Midway soil is on low knolls and ridges, and it is surrounded by smoothly sloping patches of the Lohmiller soil. The highest knolls and ridges rise to 15 to 30 feet above the Lohmiller soils. Slopes are 4 to 10 percent on the Lohmiller soil and 10 to 15 percent on the Midway soil. The Lohmiller soil in this complex has a profile similar to the one described as representative of the Lohmiller series, but it is steeper. Included in mapping are spots of Lohmiller soils that are underlain by shale at a depth of 3 to 5 feet.

Runoff is medium, and the hazard of erosion is moderate. These soils are suited to watershed, recreation, wildlife, range, hay, and pasture. Capability unit IVe–3 dryland; Clayey range site, 10- to 14-inch precipitation zone; windbreak suitability group 2M.

Macar Series

The Macar series consists of deep, gently sloping, well-drained soils on fans and foot slopes in dissected sedimentary highlands. Slopes range from 4 to 8 percent. These soils formed in loam alluvium. Elevation ranges from 3,500 to 4,000 feet.

The native vegetation is mainly Hoods phlox, western yarrow, western wheatgrass, and silver sagebrush. Annual precipitation is 14 to 16 inches, the average annual soil temperature is 45° to 47° F, and the frost-free period is 90 to 115 days.

In a representative profile the surface layer is grayish-brown loam about 3 inches thick. The subsoil is brown loam about 10 inches thick. The substratum is brown and pale-brown loam, clay loam, and gravelly clay loam that extends to a depth of 61 inches or more.

Permeability is moderate, and available water capacity is high. The effective rooting depth is 60 inches or more. These soils are used for dryfarmed and irrigated crops, watershed, wildlife, recreation, and range.

Representative profile of Macar loam, 4 to 8 percent slopes, 2,600 feet north and 990 feet east of the SW. corner sec. 21, T. 7 S., R. 39 E.

A1—0 to 3 inches, grayish-brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; moderate, thin, platy structure; slightly hard, friable, slightly sticky and slightly plastic; few fine and common very fine roots; few fine shale chips; slightly effervescent; clear, smooth boundary.

B21—3 to 8 inches, brown (7.5YR 5/3) loam, dark brown (7.5YR 4/3) moist; weak, medium, prismatic structure; hard, friable, slightly sticky and slightly plastic; common very fine and few fine roots; common very fine pores; slightly effervescent; few fine shale chips; gradual, wavy boundary.

B22—8 to 13 inches, brown (7.5YR 5/3) loam, dark brown (7.5YR 4/3) moist; moderate, coarse, prismatic structure; hard, friable, slightly sticky and slightly plastic; common very fine roots; many very fine pores; few fine shale chips; slightly effervescent; gradual, wavy boundary.

C1—13 to 19 inches, brown (7.5YR 5/3) loam, dark brown (7.5YR 4/3) moist; moderate, coarse, prismatic structure; hard, friable, slightly sticky and slightly

plastic; common very fine roots; many very fine pores; few fine shale chips; slightly effervescent; gradual, wavy boundary.

C2ca—19 to 34 inches, pale-brown (10YR 6/3) light clay loam, brown (10YR 5/3) moist; weak, coarse, prismatic structure; hard, friable, sticky and plastic; few very fine roots; common very fine pores; few fine shale chips; strongly effervescent; few fine lime threads in lower part; clear, wavy boundary.

C3—34 to 47 inches, pale-brown (10YR 6/3) gravelly light clay loam, yellowish brown (10YR 4/3) moist; massive; hard, friable, sticky and plastic; few very fine roots; few very fine pores; 15 percent (volume) fine shale chips; strongly effervescent; gradual, wavy boundary.

C4—47 to 61 inches, pale-brown (10YR 6/3) loam, yellowish brown (10YR 5/4) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; strongly effervescent.

The soil between depths of 10 and 40 inches ranges from loam to light clay loam. Coarse fragments make up 0 to 20 percent of the C horizon. Hue is 7.5YR and 10YR throughout. The A horizon is grayish brown and brown. The B horizon is grayish brown, light brownish gray, and brown. The C horizon ranges from 0 to 20 percent (volume) coarse fragments. The Cca horizon is pale brown, light brown, and pink.

Macar loam, 4 to 8 percent slopes (Ma).—This soil is on foot slopes and fans. Areas are 5 to 15 acres in size. Most areas receive runoff from soils above them. Slopes range from 100 to 300 feet long. Included in mapping are small areas of Farnuf loam.

Runoff is medium, and the hazard of erosion is moderate. This soil is suited to irrigated and dry-farmed crops, hay, watershed, wildlife, recreation, and range. Capability unit IIIe–3 dryland, IIIe–1 irrigated; Silty range site, 10- to 14-inch precipitation zone; windbreak suitability group 1.

Maginnis Series

The Maginnis series consists of shallow, hilly and very steep, excessively drained soils on sedimentary uplands. Slopes range from 15 to 65 percent. These soils formed in place in material weathered from hard shale and sandstone. Elevation ranges from 4,000 to 5,000 feet.

The native vegetation is mainly Idaho fescue, western wheatgrass, bluebunch wheatgrass, scurfpea, licorice, and prairie junegrass. Annual precipitation is 14 to 16 inches, the average annual soil temperature is 45° to 47° F, and the frost-free period is 90 to 105 days.

In a representative profile the surface layer is grayish-brown channery loam and channery silty clay loam about 6 inches thick. The subsoil is grayish-brown channery silty clay about 4 inches thick. The substratum is light yellowish-brown very channery clay. Hard, laminated shale and sandstone are at a depth of about 16 inches.

Permeability is moderately slow, and available water capacity is very low. The effective rooting depth is 20 inches. These soils are used for range watershed, recreation, and wildlife.

Representative profile of Maginnis channery loam, in an area of Maginnis-Shale outcrop complex, very steep, in grassland, 1,800 feet south and 200 feet east of the NW. corner sec. 33, T. 4 S., R. 28 E.

A11—0 to 3 inches, grayish-brown (2.5Y 5/2) channery heavy loam, very dark grayish brown (2.5Y 3/2) moist; weak, very fine, granular structure; soft, friable, slightly sticky and plastic; many very fine roots; 20 percent thin, flat, hard sandstone fragments; clear, smooth boundary.

A12—3 to 6 inches, grayish-brown (2.5Y 5/2) channery silty clay loam, very dark grayish brown (2.5Y 3/2) moist; moderate, medium, granular structure; hard, friable, sticky and plastic; 25 percent (volume) sandstone fragments of channer size; many very fine roots matted between layered hard sandstone channers; clear, wavy boundary.

B2—6 to 10 inches, grayish-brown (2.5Y 5/2) channery silty clay, olive brown (2.5Y 4/4) moist; moderate, fine, blocky structure; very hard, firm, very sticky and very plastic; 35 percent (volume) sandstone fragments of channer size; many very fine roots matted between layered hard sandstone channers; clear, wavy boundary.

C—10 to 16 inches, light yellowish-brown (2.5Y 6/4) very channery clay, light olive brown (2.5Y 5/4) moist; massive; very hard, firm, very sticky and very plastic; common micro roots; 50 percent (volume) hard sandstone fragments of channer size; abrupt, wavy boundary.

R—16 to 17 inches, hard, platy, thinly laminated sandstone and shale; thin lime coatings on the bottoms of the plates.

Depth to bedrock ranges from 10 to 20 inches. The upper 6 inches of the soil ranges from 5 to 35 percent fragments of channer and gravel size, and below a depth of 6 inches, from 45 to 80 percent. Hue is 10YR and 2.5Y throughout. The A1 horizon is grayish brown and dark grayish brown. The B2 horizon is dark brown, dark grayish brown, and grayish brown. The B and C horizons range from 35 to 45 percent clay.

Maginnis-Shale outcrop complex, very steep (MB).—This complex is made up of very steep soils in the sedimentary uplands. It is 40 to 60 percent Maginnis channery loam and 40 to 60 percent Shale outcrop. Slopes are 35 to 65 percent on the Maginnis soil and 45 to 90 percent on the Shale outcrop. The Maginnis soil in this complex has the profile described as representative of the Maginnis series. Included in mapping, and making up 5 to 10 percent of the area of this mapping unit, are areas of red-colored Pierre clay and Kyle clay.

Runoff is rapid, and the hazard of erosion is severe. These soils are suited to range, watershed, recreation, and wildlife. Capability unit VIIe–1 dryland; Thin Breaks range site, 15- to 19-inch precipitation zone; windbreak suitability group 4.

Maginnis-Windham complex, hilly (MC).—This complex is made up of hilly and very steep soils on gravelly terraces and benches. It is about 65 percent Maginnis channery loam and 35 percent Windham gravelly loam. Slopes are mostly 15 to 35 percent, but they range to 50 percent. The Windham soil has slopes of 15 to 25 percent, and the Maginnis soil has slopes of 25 to 50 percent. The Windham soil is on the upper sides and along the rims of drainageways. The Maginnis soil is on the lower eroded sides and in the bottoms of drainageways. A few spots of Shale outcrop are included with the Maginnis soil in mapping, and gravel is scattered on the surface.

Runoff is rapid, and the hazard of erosion is severe. These soils are used for range, watershed, and wildlife. Capability unit VIe–1 dryland; Thin Hilly range site, 15- to 19-inch precipitation zone; windbreak suitability group 4.

Marias Series

The Marias series consists of deep, nearly level to strongly sloping, well-drained soils on terraces, fans, and foot slopes. Slopes range from 0 to 15 percent. These soils formed in clay alluvium. Elevation ranges from 3,600 to 4,200 feet.

The native vegetation is mainly scurfpea, western yarrow, broom snakeweed, and western wheatgrass. Annual precipitation is 14 to 16 inches, the average annual soil temperature is 44° to 46° F, and the frost-free period is 95 to 115 days.

In a representative profile the surface layer is grayish-brown and dark grayish-brown silty clay and clay about 4 inches thick. The subsoil is dark grayish-brown clay about 6 inches thick. The substratum is grayish-brown and olive clay and gray silty clay that extends to a depth of 60 inches or more.

Permeability is very slow, and available water capacity is moderate or high. The effective rooting depth is 60 inches or more. These soils are used for irrigated and dryfarmed crops, watershed, wildlife, recreation and range.

Representative profile of Marias clay, 4 to 8 percent slopes, in grassland, 2,000 feet west and 50 feet south of the NE. corner sec. 12, T. 8 S., R. 33 E.

A11—0 to 1 inch, grayish-brown (2.5Y 5/2) silty clay, very dark grayish brown (2.5Y 3/2) moist; weak, coarse, granular structure; hard, firm, sticky and plastic; many fine roots; clear, smooth boundary.

A12—1 inch to 4 inches, dark grayish-brown (2.5Y 4/2) clay, very dark grayish brown (2.5Y 3/2) moist; moderate, fine, blocky structure; very hard, firm, very sticky and very plastic; common fine roots; few fine pores; clear, smooth boundary.

B2—4 to 10 inches, dark grayish-brown (2.5Y 4/2) clay, very dark grayish brown (2.5Y 3/2) moist; moderate, coarse, prismatic structure parting to strong, fine and medium, blocky; very hard, very firm, very sticky and very plastic; common fine roots; few very fine pores; slightly effervescent; clear, wavy boundary.

C1—10 to 16 inches, grayish-brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; weak, coarse, prismatic structure parting to moderate, coarse, blocky; very hard, very firm, very sticky and very plastic; few fine roots; common fine pores; strongly effervescent; gradual, wavy boundary.

C2—16 to 24 inches, grayish-brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; moderate, coarse, blocky structure; very hard, very firm, very sticky and extremely plastic; few fine roots; few very fine pores; strongly effervescent; few medium, soft lime masses; gradual, wavy boundary.

C3ca—24 to 34 inches, olive (5Y 5/3) clay, olive gray (5Y 4/2) moist; moderate, coarse, blocky structure; very hard, extremely firm, very sticky and extremely plastic; very few fine roots; few fine pores; few slickensides; strongly effervescent; common coarse and medium, soft lime masses; clear, wavy boundary.

C4—34 to 48 inches, olive (5Y 5/3) clay, olive gray (5Y 4/2) moist; strong, coarse, blocky structure; very hard, extremely firm, very sticky and extremely plastic; very few fine roots; few fine pores; many slickensides; strongly effervescent; clear, wavy boundary.

C5—48 to 60 inches, gray (5Y 5/1) silty clay, olive gray (5Y 4/2) moist; massive; very hard, extremely firm, very sticky and extremely plastic; very few fine roots; many slickensides; strongly effervescent; common coarse gypsum crystals.

Hue is 2.5Y and 5Y throughout. The A1 horizon is grayish brown, dark grayish brown, and olive gray. The soil between depths of 10 and 40 inches ranges from 40 to 60 percent clay. The B2 horizon is dark grayish brown, olive gray, and light olive brown. The C horizon is light yellowish brown, light olive brown, olive gray, and gray.

Marias soils in the Big Horn County Area have a thicker, darker colored surface layer and a higher moisture regime than typical for the series, but these differences do not alter the use or behavior of the soils.

Marias clay, 0 to 2 percent slopes (Md).—This soil is on fans and terraces. It has a profile similar to the one described as representative of the series, but it is noncalcareous to a depth of about 8 inches and is less sloping.

Runoff is slow, and the hazard of erosion is slight. This soil is suited to irrigated and dryfarmed crops, hay, wildlife, recreation, and range. Capability unit IIs–2 dryland, IIIs–1 irrigated; Clayey range site, 15- to 19-inch precipitation zone; windbreak suitability group 1.

Marias clay, 2 to 4 percent slopes (Me).—This soil is on fans and terraces. Slopes are 200 to 350 feet long. The soil has a profile similar to the one described as representative of the series, but it is less sloping.

Runoff is medium, and the hazard of erosion is moderate. This soil is suited to irrigated and dryfarmed crops, hay, wildlife, recreation, and range. Capability unit IIe–2 dryland, IIIe–3 irrigated; Clayey range site, 15- to 19-inch precipitation zone; windbreak suitability group 1.

Marias clay, 4 to 8 percent slopes (Mf).—This soil is on fans and foot slopes. Areas range from 10 to 40 acres in size. Slopes are smooth and are as much as 200 feet long. The soil has the profile described as representative of the series.

Included with this soil in mapping are small areas of soils that are noncalcareous to a depth of 12 inches, ½-acre areas of soils that have a gravelly surface layer, and some areas of Eltsac and Norbert clays.

Runoff is medium, and the hazard of erosion is moderate. This soil is suited to irrigated and dryfarmed crops, hay, watershed, wildlife, recreation, and range. Capability unit IIIe–3 dryland, IVe–1 irrigated; Clayey range site, 15- to 19-inch precipitation zone; windbreak suitability group 1.

Marias clay, 8 to 15 percent slopes (Mg).—This soil is on foot slopes. It has a profile similar to the one described as representative of the series, but it is steeper.

Included with this soil in mapping are areas of soils that are calcareous to the surface, Lismas clay, Eltsac clay, and Savage silty clay loam. Surface gravel is common below gravel-capped hills.

Runoff is rapid, and the hazard of erosion is severe. Most areas receive runoff from soils above them. This soil is suited to dryfarmed crops, hay, wildlife, recreation, watershed, and range. Capability unit IVe–2 dryland; Clayey range site, 15- to 19-inch precipitation zone; windbreak suitability group 1.

Maschetah Series

The Maschetah series consists of deep, rolling, well-drained soils on eroded terraces in bedrock uplands. Slopes range from 8 to 15 percent. These soils formed

in alluvial and eolian silt deposits. Elevation ranges from 3,500 to 4,000 feet.

The native vegetation is mainly western wheatgrass, broom snakeweed, fringed sagewort, big sagebrush, and needleandthread. Annual precipitation is 15 to 16 inches, the average annual soil temperature is 46° to 47° F, and the frost-free period is 105 to 115 days.

In a representative profile the surface layer is grayish-brown silt loam about 6 inches thick. The underlying material is light brownish-gray, light-gray, and pale-yellow silty clay loam and silt loam that extends to a depth of 65 inches or more.

Permeability is moderately slow, and available water capacity is high. The effective rooting depth is 60 inches or more. These soils are used for range, wildlife, recreation, watershed, and dryfarmed crops.

Representative profile of Maschetah silt loam, in an area of Maschetah complex, rolling, in grassland, 660 feet west and 150 feet north of the SE. corner sec. 19, T. 5 S., R. 33 E.

A11—0 to 3 inches, grayish-brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; moderate, fine, granular structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; clear, smooth boundary.

A12—3 to 6 inches, grayish-brown (10YR 5/2) heavy silt loam, very dark grayish brown (10YR 3/2) moist; weak, very fine, blocky structure; hard, friable, slightly sticky and plastic; common very fine roots; slightly effervescent; clear, wavy boundary.

C1—6 to 13 inches, light brownish-gray (2.5Y 6/2) light silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate, medium, prismatic structure parting to moderate, fine and medium, blocky; hard, friable, sticky and plastic; common very fine roots; common very fine tubular pores; strongly effervescent; few fine, soft lime masses; clear, wavy boundary.

C2ca—13 to 19 inches, light-gray (2.5Y 7/2) light silty clay loam, light olive brown (2.5Y 5/4) moist; weak, medium, prismatic structure parting to moderate, fine and medium, blocky; hard, friable, sticky and slightly plastic; common very fine roots; many very fine tubular pores; moderately effervescent; many fine and medium, soft lime masses; diffuse irregular boundary.

C3ca—19 to 30 inches, light-gray (2.5Y 7/2) heavy silt loam, light olive brown (2.5Y 5/4) moist; moderate, coarse, prismatic structure parting to weak, coarse, blocky; hard friable, sticky and slightly plastic; few very fine roots; common very fine tubular pores; violently effervescent; common fine and medium, soft lime masses; gradual, wavy boundary.

C4—30 to 43 inches, pale-yellow (2.5Y 7/4) silt loam, light olive brown (2.5Y 5/4) moist; weak, coarse, prismatic structure; hard, friable, slightly sticky and slightly plastic; few very fine roots; common very fine tubular pores; strongly effervescent; common fine, soft lime masses; gradual, wavy boundary.

C5—43 to 65 inches, pale-yellow (2.5Y 7/4) silt loam, light olive brown (2.5Y 5/4) moist; massive; hard, friable, slightly sticky and slightly plastic; common very fine tubular pores; strongly effervescent.

The soil between depths of 10 and 40 inches is silt loam or silty clay loam. Below a depth of 10 inches, the soil ranges from 0 to 5 percent coarse fragments. Hue is 2.5Y and 10Y throughout. The A horizon ranges from 4 to 7 inches in thickness. It ranges from brown to dark grayish brown. The Cca horizon has a 20- to 30-percent calcium carbonate equivalent.

Maschetah complex, rolling (MH).—This complex is made up of rolling soils on dissected gravelly terraces and loess-mantled hills and ridges. It is about 50 percent Maschetah silt loam and 50 percent Judith gravelly loam. Slopes range from 8 to 15 percent. The Maschetah soil is on the smoother parts of the land surface, and the Judith soil is on the edges of terraces and the sides of deep drainageways. The Maschetah soil in this complex has the profile described as representative of the Maschetah series. The Judith soil has a profile similar to the one described as representative of the Judith series, but it has a thin grayish-brown surface layer.

Runoff is rapid, and the hazard of erosion is severe. These soils are suited to range, wildlife, recreation, watershed, hay, pasture, and dryfarmed crops. Capability unit IVe–2 dryland; Silty range site, 15- to 19-inch precipitation zone; windbreak suitability group 3L.

Maschetah-Norbert complex, hilly (MK).—This complex is made up of hilly and steep soils on dissected and eroded, gravelly and loess-mantled shale uplands. It is 40 to 70 percent Maschetah silt loam and 20 to 40 percent Norbert clay. The terrain typically consists of ridges and hills, but the soils in this complex are also in a narrow band along the gravelly rims and sides of deep valleys. Slopes are mostly 15 to 25 percent, but they range to 35 percent. In places landslides and slips form where the valley rims have collapsed. The Maschetah soil is on hills, ridges, and the upper third of the valley side slopes. The Norbert soil is on the lower part of the valley side slopes. The Maschetah and Norbert soils in this complex have profiles similar to the ones described as representative of their respective series, but a few fragments of gravel size are on the surface in places.

Included with these soils in mapping are areas of Windham gravelly loam and Xavier silty clay loam. Also included are areas of Belfield silt loam and Savage silty clay loam in wide valley on small fans.

Runoff is rapid, and the hazard of erosion is severe. These soils are suited to range, wildlife, recreation, and watershed. Capability unit VIe–1 dryland; Thin Hilly range site, 15- to 19-inch precipitation zone; windbreak suitability group 4.

Mayflower Series

The Mayflower series consists of moderately deep, strongly sloping and rolling, well-drained soils on ridges, hills, and foot slopes in the sedimentary highlands. Slopes are mostly 8 to 15 percent, but they range to 4 percent. These soils formed in clay residuum derived from shale. Elevation ranges from 5,500 to 8,000 feet.

The native vegetation is mainly rough fescue, wild geranium, horse mint, mountain brome, big sagebrush, and bedstraw. Annual precipitation is 18 to 24 inches, the average annual soil temperature is 40° to 42° F, and the frost-free period is 60 to 80 days.

In a representative profile the surface layer is dark grayish-brown silt loam about 6 inches thick. The subsoil is dark grayish-brown, brown, and reddish-brown silty clay loam and silty clay about 23 inches thick. The substratum is light reddish-brown silty clay loam.

Red sandstone and clay shale are at a depth of about 34 inches.

Permeability is slow, and available water capacity is moderate. The effective rooting depth is about 36 inches. These soils are used for range, game range, watershed, and recreation.

Representative profile of Mayflower silt loam, rolling, in grassland, 1,300 feet west and 300 north of the SE. corner sec. 17, T. 9 S., R. 32 E.

A11—0 to 2 inches, dark grayish-brown (10YR 3/2) silt loam, very dark gray (10YR 3/1) moist; weak, medium, granular structure; soft, nonsticky and slightly plastic; clear, smooth boundary.

A12—2 to 6 inches, dark grayish-brown (10YR 4/2) silt loam, very dark grayish brown (10YR 3/2) moist; moderate, medium, platy structure parting to weak, fine, blocky; slightly hard, friable, slightly sticky and plastic, gradual, wavy boundary.

B1—6 to 11 inches, dark grayish-brown (10YR 4/2) silty clay loam, dark brown (10YR 3/3) moist; moderate, medium and fine, blocky structure; hard, friable, sticky and plastic; clear, wavy boundary.

B21t—11 to 19 inches, brown (7.5YR 4/3) silty clay, dark brown (7.5YR 3/3) moist; strong, fine and medium, blocky structure; very hard, firm, very sticky and very plastic; thin, patchy clay films on peds; clear, wavy boundary.

B22t—19 to 29 inches, reddish-brown (5YR 5/3) silty clay, reddish brown (5YR 4/4) moist; strong, fine, blocky structure; very hard, firm, very sticky and very plastic; thin, patchy clay films on peds; clear, wavy boundary.

Cca—29 to 34 inches, light reddish-brown (5YR 6/4) silty clay loam, yellowish red (5YR 4/5) moist; weak, medium, blocky structure; hard, friable, very sticky and plastic; strongly effervescent; clear, wavy boundary.

R—34 to 51 inches, red sandstone and clay shale; common coarse lime mottles between the plates.

Depth to shale and sandstone ranges from 20 to 40 inches. The dark-colored surface layer ranges from 16 to 24 inches in thickness. The soil ranges from 0 to 20 percent coarse limestone fragments. Hue is 10YR and 7.5YR in the A horizon and 7.5YR and 5YR in the B and C horizons. The A horizon is dark grayish brown, very dark grayish brown, brown, and dark brown. The B2t horizon ranges from dark-brown, brown, reddish-brown, and dark reddish-gray silty clay to heavy silty clay loam. The C horizon is light reddish brown, light brown, and reddish yellow.

Mayflower silt loam, rolling (Mm).—This soil is on ridges and hills in the sedimentary highlands. Slopes are smooth. They are mostly 12 to 15 percent, but they range to 8 percent. The soil has the profile described as representative of the series. Included in mapping are some areas of soils that have a surface layer of loam and scattered chert and limestone fragments on the surface.

Runoff is medium, and the hazard of erosion is moderate. This soil is suited to range, wildlife, watershed, and recreation. Capability unit IVe–2 dryland; Silty range site, 20- to 24-inch precipitation zone; windbreak suitability group 2M.

Mayflower association, rolling (MN).—This association is made up of Mayflower silty clay loam and Tarrete silty clay on ridges and hills in the sedimentary highlands. It is about 70 percent Mayflower silty clay loam and 30 percent Tarrete silty clay. It is typically above the limestone rims of deep canyons. Slopes are mostly 12 to 15 percent on valley sides and 8 to 12 percent on ridgetops. The Mayflower soil is on the upper sides of the hills and ridges, and the Tarrete soil is on the lower sides. Included in mapping are small, narrow bands of Duncom channery loam along the edges of the canyons.

Runoff is medium, and the hazard of erosion is moderate. These soils are used for range, game range, watershed, and recreation. Capability unit IVe–2 dryland; Silty range site, 20- to 24-inch precipitation zone; windbreak suitability group 1.

McKenzie Series

The McKenzie series consists of deep, nearly level, poorly drained soils in basins and depressions. Slopes range from 0 to 1 percent. These soils formed in deep clay sediment washed from fine-textured shale and mudstone. Elevation ranges from 3,200 to 4,000 feet.

The native vegetation is mainly western wheatgrass and sedges. Annual precipitation is 13 to 14 inches, the average annual soil temperature is 47° to 49° F, and the frost-free period is 110 to 125 days.

In a representative profile the surface layer is gray clay about 1 inch thick. The subsoil is gray clay about 11 inches thick. The substratum is light olive-gray and pale-olive clay that extends to a depth of 60 inches or more.

Permeability is very slow, and available water capacity is moderate or high. The effective rooting depth is 60 inches or more. These soils are used for range, wildlife, recreation, and dryfarmed crops.

Representative profile of McKenzie clay, in grassland, 2,300 feet south and 200 feet east of the NW. corner sec. 23, T. 1 S., R. 30 E.

A1—0 to 1 inch, gray (5Y 5/1) clay, olive gray (5Y 4/2) moist; strong, firm, granular structure; very hard, firm, very sticky and very plastic; common fine and very fine roots; slightly effervescent; clear, smooth boundary.

B21—1 inch to 7 inches, gray (5Y 5/1) clay, dark gray (5Y 4/1) moist; strong, fine, granular structure; very hard, firm, very sticky and very plastic; common fine and very fine roots; slightly effervescent; gradual, wavy boundary.

B22—7 to 12 inches, gray (5Y 6/1) clay, dark gray (5Y 4/1) moist; moderate, medium and coarse, blocky structure; extremely hard, very firm, very sticky and extremely plastic; few very fine roots; common very fine pores; strongly effervescent; gradual, wavy boundary.

C1—12 to 23 inches, light olive-gray (5Y 6/2) clay, olive gray (5Y 5/2) moist; moderate, coarse structure; extremely hard, very firm, very sticky and extremely plastic; common micro pores; strongly effervescent; gradual, wavy boundary.

C2—23 to 36 inches, light olive-gray (5Y 6/2) clay, olive gray (5Y 5/2) moist; massive; extremely hard, very firm, very sticky and extremely plastic; very few very fine roots; very few very fine pores; strongly effervescent; few medium seams of gypsum crystals; clear, wavy boundary.

C3—36 to 60 inches, pale-olive (5Y 6/3) clay, olive (5Y 5/3) moist; massive; very hard, very firm, very sticky and very plastic; very few very fine pores; few medium seams and masses of gypsum crystals.

The soil ranges from clay to silty clay that is 50 to 60 percent clay. The A horizon is gray, light gray, and grayish brown. The B horizon is gray and light olive gray. The C horizon ranges from pale olive to light olive gray.

McKenzie soils in the Big Horn County Area are in a slightly warmer climate than is typical for the series, but this difference does not affect the use and behavior of the soils.

McKenzie clay (Mo).—This nearly level soil is in swales and depressions in rolling to hilly parts in the sedimentary uplands. Slopes are 0 to 1 percent. Areas range from 20 to 500 acres in size. The surface is ponded when the snow melts in spring and following rain early in summer.

Runoff is slow, and the hazard of erosion is slight. This soil is used for dryfarmed crops, wildlife, recreation, and range. Capability unit IIIw–2 dryland; Overflow range site, 10- to 14-inch precipitation zone; windbreak suitability group 1.

McRae Series

The McRae series consists of deep, nearly level to steep, well-drained soils on fans, foot slopes, and eroded terraces. Slopes range from 0 to 35 percent. These soils formed in loam and clay loam alluvium. Elevation ranges from 2,800 to 3,800 feet.

The native vegetation is mainly blue grama, needleandthread, western wheatgrass, big sagebrush, and cheatgrass. Annual precipitation is 12 to 14 inches, the average annual soil temperature is 47° to 49° F, and the frost-free period is 115 to 125 days.

In a representative profile the surface layer is grayish-brown loam about 2 inches thick. The subsoil is grayish-brown and light yellowish-brown loam about 8 inches thick. The substratum is pale-olive and pale-yellow loam that extends to a depth of 63 inches or more.

Permeability is moderate, and available water capacity is high. The effective rooting depth is 60 inches or more. These soils are used for irrigated and dryfarmed crops, watershed, wildlife, recreation, and range.

Representative profile of McRae loam, 4 to 8 percent slopes, in grassland, 1,900 feet south and 800 feet west of the NE. corner sec. 35, T. 3 N., R. 33 E.

A—0 to 2 inches, grayish-brown (2.5Y 5/2) loam, dark grayish brown (2.5Y 4/2) moist; moderate, coarse, platy structure; slightly hard, friable, nonsticky and slightly plastic; many fine and few coarse roots; clear, smooth boundary.

B21—2 to 5 inches, grayish-brown (2.5Y 5/2) heavy loam, olive brown (2.5Y 4/4) moist; moderate, coarse and medium, prismatic structure parting to moderate, coarse, blocky; hard, friable, sticky and plastic; few fine roots; few fine pores; clear, wavy boundary.

B22—5 to 10 inches, light yellowish-brown (2.5Y 6/4) heavy loam, light olive brown (2.5Y 5/4) moist; moderate, coarse, prismatic structure parting to moderate, coarse, blocky; hard, friable, slightly sticky and slightly plastic; few fine roots; few fine pores; strongly effervescent; few fine, soft lime masses; gradual, wavy boundary.

C1ca—10 to 17 inches, pale-olive (5Y 6/3) heavy loam, olive (5Y 5/3) moist; weak, coarse, prismatic structure; hard, friable, sticky and plastic; few fine roots; many fine and few medium pores; strongly effervescent; few fine and medium, soft lime masses; gradual, wavy boundary.

C2ca—17 to 24 inches, pale-yellow (5Y 7/3) heavy loam, pale olive (5Y 6/3) moist; hard, friable, sticky and plastic; massive; hard, friable, sticky and plastic; few fine roots; many fine and few medium pores; strongly effervescent; few fine and medium, soft lime masses; diffuse boundary.

C3—24 to 63 inches, pale-yellow (5Y 7/3) loam, pale olive (5Y 6/3) moist; massive; slightly hard, friable, slightly sticky and plastic; few fine roots; common fine pores; strongly effervescent; few fine, soft lime masses.

The soil ranges from 0 to 15 percent coarse fragments. Hue ranges from 10YR to 5Y throughout. The A horizon is grayish-brown and light brownish-gray loam or silty clay loam. The B2 horizon is grayish brown, light yellowish brown, light brownish gray, and pale brown. The Cca horizon is pale yellow, light yellowish brown, and pale olive.

McRae loam, 0 to 1 percent slopes (Mp).—This nearly level soil is on fans. It has a profile similar to the one described as representative of the series, but it is less sloping. Included in mapping are areas of soils that have a surface layer of silt loam.

Runoff is slow, and the hazard of erosion is slight. This soil is suited to irrigated and dryfarmed crops, hay, wildlife, recreation, and range. Capability unit IIIc–1 dryland, IIc–1 irrigated; Silty range site, 10- to 14-inch precipitation zone; windbreak suitability group 1.

McRae loam, 1 to 4 percent slopes (Mr).—This soil is in 10- to 25-acre areas on fans and foot slopes. It has a profile similar to the one described as representative of the series, but it is less sloping. Included in mapping are areas of soils that have a surface of silt loam.

Runoff is medium, and the hazard of erosion is moderate. This soil is suited to irrigated and dryfarmed crops, hay, wildlife, recreation, and range. Capability unit IIIe–3 dryland, IIe–1 irrigated; Silty range site, 10- to 14-inch precipitation zone; windbreak suitability group 1.

McRae loam, 4 to 8 percent slopes (Ms).—This soil is on foot slopes and fans. Areas range from 15 to 50 acres in size and in places are dissected by short gullies. The soil has the profile described as representative of the series. A few surface pebbles are present where gravel terraces border the valleys. Included in mapping are areas of soils that have a surface layer of silt loam.

Runoff is medium, and the hazard of erosion is moderate. Most areas receive runoff from soils above them. This soil is suited to irrigated and dryfarmed crops, hay, watershed, wildlife, recreation, and range. Capability unit IIIe–3 dryland, IIIe–1 irrigated; Silty range site, 10- to 14-inch precipitation zone; windbreak suitability group 1.

McRae silty clay loam, 0 to 1 percent slopes (Mt).—This soil is on broad fans. It has a profile similar to the one described as representative of the series, but it is less sloping, and the surface layer is silty clay loam 8 to 12 inches thick. Where the soil is below gravel terraces, a few pebbles are on the surface.

Runoff is slow, and the hazard of erosion is slight. This soil is suited to irrigated and dryfarmed crops, hay, wildlife, recreation, and range. Capability unit IIIc–1 dryland, IIc–1 irrigated; Clayey range site, 10- to 14-inch precipitation zone; windbreak suitability group 1.

Midway Series

The Midway series consists of shallow, gently sloping to steep and undulating to hilly, well-drained soils in the sedimentary uplands. Slopes range from 2 to 35

percent. These soils formed in place in material weathered from silty clay loam and silty clay shale. Elevation ranges from 3,000 to 4,000 feet.

The native vegetation is side-oats grama, green needlegrass, big sagebrush, skunkbush sumac, western wheatgrass, and broom snakeweed. Annual precipitation is 12 to 14 inches, the average annual soil temperature is 47° to 49° F, and the frost-free period is 105 to 115 days.

In a representative profile the surface layer is light olive-gray silty clay loam about 2 inches thick. The underlying material is olive-gray silty clay loam that is 30 percent, by volume, shale chips in the lower part. Shale is at a depth of about 11 inches.

Permeability is slow, and available water capacity is very low. The effective rooting depth is about 15 inches. Most of these soils are used for range, recreation, wildlife, and watershed. Small areas are used for dryfarmed crops.

Representative profile of Midway silty clay loam, hilly, in grassland, 1,320 feet south and 2,000 feet east of the NW. corner sec. 30, T. 1 S., R. 30 E.

A1—0 to 2 inches, light olive-gray (5Y 6/2) light silty clay loam, olive gray (5Y 5/2) moist; strong, very fine, granular structure; hard, friable, sticky and plastic; common fine roots; slightly effervescent; clear, smooth boundary.

C1—2 to 5 inches, olive-gray (5Y 5/2) silty clay loam, olive gray (5Y 4/2) moist; moderate, thin, platy structure; hard, firm, very sticky and plastic; many fine and micro roots; many micro pores; strongly effervescent; gradual, wavy boundary.

C2—5 to 11 inches, olive-gray (5Y 5/2) channery silty clay loam, olive gray (5Y 4/2) moist; weak, coarse, blocky structure; hard, firm, very sticky and very plastic; common fine roots; common fine and micro pores; 30 percent (volume) fine, slightly weathered shale chips; strongly effervescent; diffuse, wavy boundary.

C3—11 to 14 inches, platy shale; root mats between horizontal fractures.

Depth to shale ranges from 6 to 20 inches. The soil ranges from 35 to 45 percent clay throughout. Hue is 2.5Y or 5Y throughout. The A1 horizon is light olive-brown, light olive-gray, and light brownish-gray silty clay loam, clay loam, or clay. The C horizon ranges from 5 to 35 percent, by volume, shale chips.

Midway soils in the Big Horn County Area are more olive in color (5Y hue) than is typical for the series, but this difference does not affect the use and management of the soils.

Midway silty clay loam, undulating (Mu).—This soil is in narrow, irregularly shaped areas on smooth ridges. Slopes range from 100 to 250 feet long. Slopes are mostly 5 to 8 percent, but they range to 2 percent. The soil has a profile similar to the one described as representative of the series, but it is less sloping.

Included with this soil in mapping are areas of Renohill silty clay loam and a few spots of soils that have a surface layer of gravelly silty clay loam.

Runoff is medium, and the hazard of erosion is moderate. This soil is suited to dryfarmed crops, pasture, wildlife, recreation, watershed, and range. Capability unit IVe–3 dryland; Clayey range site, 10- to 14-inch precipitation zone; windbreak suitability group 3M.

Midway silty clay loam, rolling (MVa).—This soil is on ridges and hills dissected by short tributary drainageways. Slopes are 8 to 15 percent. The soil has a profile similar to the one described as representative of the series, but it is less sloping. Included in mapping are small areas of Heldt, Lohmiller, McRae, Thedalund, and Nelson soils.

Runoff is rapid, and the hazard of erosion is severe. This soil is suited to range, wildlife, recreation, and watershed. Capability unit VIe–1 dryland; Clayey range site, 10- to 14-inch precipitation zone; windbreak suitability group 3M.

Midway silty clay loam, hilly (MVb).—This soil is on deeply dissected shale uplands. Local relief ranges between 30 and 125 feet. This soil is on ridgetops, 75 to 200 feet wide, and on the upper sides of the narrow, closely spaced drainageways. Slopes range from 75 to 250 feet long. They are mostly 15 to 25 percent, but they range to 35 percent. The soil has the profile described as representative of the series.

Included with this soil in mapping are areas of Shale outcrop and small areas of Lohmiller silty clay loam. These included soils make up 10 to 35 percent of the total area of this mapping unit.

Runoff is rapid, and the hazard of erosion is severe. Geologic erosion is active on the Shale outcrop. This soil is suited to range, wildlife, recreation, and watershed. Capability unit VIe–1 dryland; Thin Hilly range site, 10- to 14-inch precipitation zone; windbreak suitability group 4.

Midway-Lismas complex, rolling (MVc).—This complex is made up of rolling soils in the sedimentary uplands. It is about 50 percent Midway clay loam and 50 percent Lismas clay. Slopes are mostly 10 to 15 percent, but they range to 8 percent. The soils are intermixed, but the Lismas soil generally has a darker colored surface layer than the Midway soil. The Midway and Lismas soils in this complex have profiles similar to the ones described as representative of their respective series, but the Midway soil has a surface layer of clay loam, the Lismas soil has ironstone concretions scattered throughout, and both soils have a few fragments of hard sandstone on the surface. Included in mapping are areas of Thedalund loam and Kyle clay.

Runoff is rapid, and the hazard of erosion is moderate. These soils are suited to range, wildlife, recreation, and watershed. Capability unit VIe-1 dryland; Clayey range site, 10- to 14-inch precipitation zone; windbreak suitability group 3M.

Midway-Lismas complex, hilly (MVd).—This complex is made up of hilly and steep soils in the sedimentary uplands. It is about equal parts of Midway clay loam and Lismas clay and 10 to 30 percent Shale outcrop. Slopes are mostly 15 to 25 percent, but they range to 35 percent. The Lismas and Midway soils are intermixed, but Shale outcrop is in deep drainageways and on narrow ridges. In places a few fragments of porcelanite and red shale are scattered on the ridges. Ironstone concretions are scattered on the Shale outcrop. The Lismas soil generally is darker colored than the Midway soil. The Midway soil in this complex has a profile similar to the one described as representative of the Midway series, but the surface layer is clay loam. Included in mapping are areas of Thedalund loam, Nelson sandy loam, and Vananda clay.

Runoff is rapid, and the hazard of erosion is severe. These soils are suited to range, wildlife, recreation, and watershed. Capability unit VIe–1 dryland; Thin Hilly range site, 10- to 14-inch precipitation zone; windbreak suitability group 4.

Midway-Thedalund complex, rolling (MVe).—This complex is made up of rolling soils in the sedimentary uplands. It is about 55 percent Midway silty clay loam, 30 percent Thedalund loam, and 15 percent Thurlow and Heldt silty clay loams. Slopes are 8 to 15 percent. The Midway and Thedalund soils are intermixed, but the Thurlow and Heldt soils are on foot slopes of wide valleys and drainageways.

Runoff is rapid, and the hazard of erosion is severe. These soils are suited to range, wildlife, recreation, and watershed. Capability unit VIe–1 dryland; Clayey range site, 10- to 14-inch precipitation zone; windbreak suitability group 3M.

Midway-Thedalund complex, hilly (MVf).—This complex is made up of rolling to hilly and steep soils in the sedimentary uplands. It is about 60 percent Midway silty clay loam, 25 percent Thedalund loam, and 15 percent Shale outcrop and Rock outcrop. Slopes are mostly 15 to 35 percent, but they range to 8 percent. Shale outcrop is mostly on the south and west faces of ridges and hills and along the rims of deep valleys. In places it has sandstone ledges 5 to 30 feet thick. Slopes are 8 to 10 percent on the ridgetops and 15 to 35 percent on the valley sides. North and east slopes in places have a 10- to 40-percent canopy of ponderosa pine and juniper.

Included with these soils in mapping are small areas of Cushman loam and Renohill silty clay loam on ridges and areas of Thurlow silty clay loam on narrow foot slopes in the wide valleys.

Runoff is rapid, and the hazard of erosion is severe. Runoff from the shaly areas carries large amounts of sediment. These soils are used for range, watershed, recreation, and game range. Capability unit VIe–1 dryland; Thin Hilly range site, 10- to 14-inch precipitation zone; windbreak suitability group 4.

Midway-Thurlow association, rolling (MVg).—This association is made up of rolling soils in the sedimentary uplands. It is about 60 percent Midway silty clay loam, 30 percent Thurlow silty clay loam, and 10 percent Renohill silty clay loam. Slopes are 8 to 15 percent. The Midway soil is on ridges and hilltops and the sides of deep drainageways. The Thurlow and Renohill soils are on the lower sides of ridges.

Runoff is medium, and the hazard of erosion is moderate. These soils are suited to watershed, wildlife, recreation, range, and pasture. Capability unit IVe–2 dryland; Clayey range site, 10- to 14-inch precipitation zone; windbreak suitability group 2M.

Morton Series

The Morton series consists of moderately deep, undulating, well-drained soils in the sedimentary uplands. Slopes are mostly 4 to 8 percent, but they range to 15 percent. These soils formed in place in material weathered from silt loam and loam shale. Elevation ranges from 4,500 to 5,200 feet.

The native vegetation is mainly silver sagebrush, green needlegrass, Idaho fescue, cudweed sagewort, and western yarrow. Annual precipitation is 16 to 18 inches, the average annual soil temperature is 44° to 46° F, and the frost-free period is 90 to 105 days.

In a representative profile the surface layer is dark grayish-brown silt loam about 5 inches thick. The subsoil is dark-brown, brown, and light yellowish-brown silty clay loam about 27 inches thick. The substratum is brownish-yellow silty clay loam. Shale and sandstone are at a depth of about 38 inches.

Permeability is moderate, and available water capacity is low or moderate. The effective rooting depth is about 36 inches. These soils are used for dry-farmed crops, wildlife, recreation, watershed, and range.

Representative profile of Morton silt loam, undulating, in grassland, 875 feet west and 500 feet north of the center of sec. 35, T. 7 S., R. 37 E.

A11—0 to 2 inches, dark grayish-brown (10YR 4/2) silt loam, very dark grayish brown (10YR 3/2) moist; moderate, coarse, granular structure; soft, friable, slightly sticky and slightly plastic; many fine and very fine roots; clear, smooth boundary.

A12—2 to 5 inches, dark grayish-brown (10YR 4/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak, medium, prismatic structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots; common very fine pores; gradual, wavy boundary.

B1—5 to 10 inches, dark-brown (10YR 4/3) light silty clay loam, dark brown (10YR 3/3) moist; moderate, medium, prismatic structure parting to moderate, medium, blocky; hard, friable, sticky and plastic; common very fine roots; common very fine pores; clear, wavy boundary.

B21t—10 to 17 inches, brown (10YR 5/3) silty clay loam, dark brown (10YR 3/3) moist; strong, medium, prismatic structure parting to moderate, fine and medium, blocky; hard, friable, sticky and plastic; common very fine roots; common very fine pores; moderately thick, patchy clay films on peds; clear, wavy boundary.

B22t—17 to 24 inches, brown (10YR 5/3) heavy silty clay loam, dark brown (10YR 4/3) moist; strong, medium, prismatic structure parting to strong, fine and medium, blocky; very hard, firm, very sticky and plastic; few very fine roots; many very fine pores; moderately thick, patchy clay films on peds; gradual, wavy boundary.

B3—24 to 32 inches, light yellowish-brown (10YR 6/4) silty clay loam, dark yellowish brown (10YR 4/4) moist; weak, medium, prismatic structure parting to moderate, medium, blocky; few very fine roots; many very fine pores; gradual, wavy boundary.

C1ca—32 to 38 inches, brownish-yellow (10YR 6/6) light silty clay loam, yellowish brown (10YR 5/5) moist; massive; hard, friable, very sticky and plastic; few very fine roots; many very fine pores; strongly effervescent; diffuse, irregular boundary.

C2—38 to 47 inches, interbedded soft shale and sandstone.

Depth to carbonates ranges from 15 to 35 inches, and depth to weakly consolidated shale and sandstone ranges from 20 to 40 inches. The A horizon is silt loam or loam that has hue of 10YR and 2.5Y. The B2t horizon is 27 to 38 percent clay. It is brown, dark brown, and yellowish brown and has chroma of 2 to 4. The C horizon ranges from 0 to 10 percent coarse fragments of shale and sandstone.

Morton silt loam, undulating (Mw).—This undulating and rolling soil is on ridges and hills in the sedimentary highlands. Slopes are mostly 4 to 8 percent, but they range to 15 percent. Slopes range from 200 to

500 feet long. Areas range from 40 to 350 acres in size.

Included with this soil in mapping are spots of soils that have a surface layer of channery and gravelly silt loam. Also included are areas of Regent silty clay loam.

Runoff is medium, and the hazard of erosion is moderate. In places the soil receives runoff from ridges and hills above it. This soil is suited to dryfarmed crops, hay, wildlife, recreation, watershed, and range. Capability unit IIIe–2 dryland; Silty range site, 20- to 24-inch precipitation zone; windbreak suitability group 2M.

Nelson Series

The Nelson series consists of moderately deep, undulating and rolling, well-drained soils on hills and ridges in the sedimentary uplands. Slopes are mostly 4 to 15 percent, but they range from 2 to 20 percent. These soils formed in place in material weathered from calcareous, weakly consolidated sandstone. Elevation ranges from 3,000 to 3,800 feet.

The native vegetation is mainly prairie sandreed, dryland sedges, silver sagebrush, green sagewort, yucca, and bluebunch wheatgrass. Annual precipitation is 13 to 14 inches, the average annual soil temperature is 48 ° to 50° F, and the frost-free period is 115 to 125 days.

In a representative profile the surface layer is light olive-brown and grayish-brown fine sandy loam about 5 inches thick. The underlying material is light olive-brown, light yellowish-brown, and pale-yellow sandy loam. Sandstone is at a depth of about 29 inches.

Permeability is moderately rapid, and available water capacity is low. The effective rooting depth is about 30 inches. These soils are used for range, wildlife, watershed, recreation, and crops.

Representative profile of Nelson fine sandy loam, undulating, in grassland, 1,200 feet south and 150 feet east of the NW. corner sec. 36, T. 1 N., R. 36 E.

A—0 to 3 inches, light olive-brown (2.5Y 5/4) fine sandy loam, dark grayish brown (2.5Y 4/2) moist; single grained; soft, very friable, nonsticky and slightly plastic; clear, smooth boundary.

AC—3 to 5 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, nonsticky and slightly plastic; clear, smooth boundary.

C1—5 to 16 inches, light olive-brown (2.5Y 5/4) sandy loam, dark grayish brown (2.5Y 4/2) moist; weak, coarse, prismatic structure; slightly hard, very friable, nonsticky and slightly plastic; slightly effervescent; diffuse boundary.

C2—16 to 21 inches, light yellowish-brown (2.5Y 6/4) sandy loam, light olive brown (2.5Y 5/4) moist; massive; slightly hard, friable, nonsticky and slightly plastic; strongly effervescent; diffuse boundary.

C3—21 to 29 inches, pale-yellow (5Y 7/4) sandy loam, pale olive (5Y 6/4) moist; massive and has some evidence of platy rock structure; slightly hard, friable, nonsticky and slightly plastic; strongly effervescent; clear, wavy boundary.

C4—29 to 44 inches, pale-yellow (5Y 7/4) banded soft sandstone, pale olive (5Y 6/4) moist; strongly effervescent.

Depth to calcareous material ranges from 0 to 6 inches, and depth to sandstone and loam shale from 20 to 40 inches. The soil ranges from 0 to 15 percent coarse fragments throughout. Hue is 2.5Y or 10YR in the A and AC horizons and the upper part of the C horizon and 2.5Y or 5Y in the lower part of the C horizon.

Nelson fine sandy loam, undulating (Nd).—This undulating and rolling soil is on hills and ridges in the sandstone uplands. Slopes are mostly smooth, but there are a few thin ledges and outcrops of sandstone on the steep sides of prominent ridges. Slopes are mostly 4 to 8 percent, but they range from 2 to 15 percent. The soil has the profile described as representative of the series. Included in mapping are narrow 10-acre areas of Alice fine sandy loam.

Runoff is medium, and the hazard of erosion is moderate. This soil is suited to wildlife, range, pasture, watershed, and limited dryfarmed crops. Capability unit IVe–3 dryland; Sandy range site, 10- to 14-inch precipitation zone; windbreak suitability group 3M.

Nelson-Alice fine sandy loams, rolling (Ne).—This complex is made up of rolling soils in the sedimentary uplands. It is 40 to 60 percent Nelson fine sandy loam, 30 to 45 percent Alice fine sandy loam, and 10 percent Travessilla sandy loam and Rock outcrop. Slopes are mostly 8 to 15 percent, but they range to 20 percent. The Nelson soil is on the tops and upper sides of ridges and knolls. The Alice soil is on the narrow sides and at the heads of drainageways and on foot slopes below the Nelson soil. The Travessilla soil is around areas of Rock outcrop. The Nelson and Alice soils in this complex have profiles similar to the ones described as representative of their respective series, but they are steeper.

Runoff is medium, and the hazard of erosion is severe. These soils are suited to wildlife, watershed, range, hay, and pasture. Capability unit IVe–3 dryland; Sandy range site, 10- to 14-inch precipitation zone; windbreak suitability group 3M.

Nelson-Glenberg sandy loams, undulating (NF).—This complex is made up of rolling soils in the sedimentary uplands. It is 40 to 55 percent Nelson fine sandy loam, 25 to 40 percent Glenberg fine sandy loam, and 10 to 15 percent Travessilla fine sandy loam. Slopes are mostly 8 to 20 percent, but they range to 4 percent. The Nelson soil is on ridges and hills. The Travessilla soil is on ridgetops and above low sandstone ledges on hillsides. The Glenberg soil is on foot slopes of hills and ridges and in drainageways. The Nelson and Travessilla soils in this complex have profiles similar to the ones described as representative of their respective series, but they are steeper.

Runoff is medium, and the hazard of erosion is severe. These soils are suited to wildlife, watershed, range, and pasture. Capability unit IVe–3 dryland; Sandy range site, 10- to 14-inch precipitation zone; windbreak suitability group 3M.

Neville Series

The Neville series consists of deep, undulating and rolling, well-drained soils in the sedimentary uplands. Slopes are mostly 4 to 15 percent, but they range to 2 percent. These soils formed in place in material

weathered from red shale and sandstone. Elevation ranges from 4,000 to 5,300 feet.

The native vegetation is mainly needleandthread, western wheatgrass, Hoods phlox, and big sagebrush. Annual precipitation is 11 to 13 inches, the average annual soil temperature is 47° to 49° F, and the frost-free period is 100 to 110 days.

In a representative profile the surface layer is reddish-brown loam about 2 inches thick. The underlying material is reddish-brown and light-red loam. Shale is at a depth of about 41 inches.

Permeability is moderate, and available water capacity is moderate to high. The effective rooting depth is 40 inches or more. These soils are used for range, wildlife, recreation, and watershed.

Representative profile of Neville loam, rolling, in grassland, 1,320 feet north and 1,320 feet east of the SW. corner sec. 23, T. 8 S., R. 29 E.

A—0 to 2 inches, reddish-brown (5YR 4/3) loam, dark reddish brown (5YR 3/3) moist; moderate, medium, platy structure; slightly hard, friable, slightly sticky and slightly plastic; clear, smooth boundary.

C1—2 to 5 inches, reddish-brown (2.5YR 5/4) heavy loam, dark reddish brown (2.5YR 3/4) moist; moderate, medium, prismatic structure; hard friable, sticky and plastic; clear, wavy boundary.

C2—5 to 10 inches, light-red (2.5YR 6/6) heavy loam, red (2.5Y 4/6) moist; weak, medium, prismatic structure parting to weak, medium, blocky; hard, friable, sticky and plastic; strongly effervescent; gradual, wavy boundary.

C3ca—10 to 19 inches, light-red (2.5YR 6/6) heavy loam, red (2.5YR 4/6) moist; weak, coarse, blocky structure; hard, friable, sticky and plastic; strongly effervescent; gradual, wavy boundary.

C4—19 to 41 inches, light-red (2.5YR 6/6) heavy loam, red (2.5YR 4/6) moist; massive; hard, friable, slightly sticky and slightly plastic; strongly effervescent; diffuse boundary.

C5—41 to 45 inches, red (2.5YR 5/6) soft shale.

Depth to calcareous material ranges from 2 to 6 inches, and depth to bedrock ranges from 40 to 60 inches. The soil ranges from 0 to 15 percent coarse fragments of shale and limestone. Between depths of 10 and 40 inches, the soil ranges from 18 to 30 percent clay. Hue ranges from 5YR to 10R throughout, and chroma, from 3 to 6. The A horizon is reddish brown and weak red. The C horizon is pale red, light red, light reddish brown, and reddish yellow.

Neville loam, rolling (Ng).—This rolling soil is on smooth shale and fine-grained sandstone sedimentary uplands. Slopes are mostly 8 to 15 percent, but they range to 4 percent. Areas are generally below or surrounding red shale hills and escarpments.

Included with this soil in mapping are areas of soils that are more than 40 inches deep over shale and spots of soils that have limestone fragments of gravel and channer size on the surface.

Runoff is medium, and the hazard of erosion is moderate. This soil is suited to wildlife, recreation, watershed, range, pasture, and hay. Capability unit IIIe–3 dryland; Silty range site, 10- to 14-inch precipitation zone; windbreak suitability group 2M.

Nobe Series

The Nobe series consists of deep, nearly level and gently sloping, well-drained, sodium-affected soils on fans and terraces. Slopes range from 1 to 4 percent. These soils formed in clay alluvium. Elevation ranges from 3,400 to 4,000 feet.

The native vegetation is a sparse cover of western yarrow, six-weeks fescue, western wheatgrass, broom snakeweed, and salsify. Annual precipitation is 14 to 16 inches, the average annual soil temperature is 45° to 47° F, and the frost-free period is 105 to 115 days.

In a representative profile the surface layer is light-gray silt loam about ½ inch thick. The subsoil is olive-gray silty clay about 1 inch thick. The substratum is olive-gray and gray clay that extends to a depth of 62 inches or more.

Permeability is very slow, and available water capacity is moderate or high. The effective rooting depth is 60 inches or more. These soils are used for range, wildlife, recreation, and watershed.

Representative profile of Nobe silty clay, in grassland, 1,500 feet south and 700 feet west of the NE. corner sec. 21, T. 8 S., R. 33 E.

A2—0 to ½ inch, light-gray (5Y 7/1) silt loam, olive gray (5Y 5/2) moist; massive; soft, friable, nonsticky and slightly plastic; many vesicular pores; abrupt, smooth boundary.

B2t—½ inch to 1½ inches, olive-gray (5Y 5/2) light silty clay, dark olive gray (5Y 3/2) moist; moderate, fine, prismatic structure; hard, firm, sticky and plastic; common very fine roots; tops of prisms coated with unstained sand and silt grains; abrupt, smooth boundary.

C1—1½ to 7 inches, olive-gray (5Y 5/2) light clay, dark olive gray (5Y 3/2) moist; weak, coarse, prismatic structure parting to weak, fine, blocky; very hard, very firm, very sticky and very plastic; few very fine roots; few very fine pores; slightly effervescent; clear, wavy boundary.

C2cs—7 to 15 inches, olive-gray (5Y 5/2) clay, olive gray (5Y 4/2) moist; moderate, fine, blocky structure; very hard, firm, very sticky and very plastic; few very fine roots; common very fine pores; many fine crystals of gypsum and other salts; strongly effervescent; few medium, soft lime masses; gradual, wavy boundary.

C3cs—15 to 28 inches, olive-gray (5Y 5/2) clay, olive (5Y 4/2) moist; moderate, coarse, blocky structure; very hard, very firm, very sticky and very plastic; few micro pores; many fine and medium crystals of gypsum and other salts; strongly effervescent; few fine, soft lime masses; gradual, wavy boundary.

C4cs—28 to 62 inches, gray (5Y 5/1) heavy clay, olive gray (5Y 4/2) moist; massive; extremely hard, very firm, very sticky and extremely plastic; common medium gypsum crystals; strongly effervescent:

The A2 and B2t horizons range from 1 inch to 10 inches in combined thickness. The B2t horizon is 40 to 50 percent clay. It is olive gray or grayish brown. The C and Ccs horizons range from gray to light brownish-gray clay or silty clay. The lower part of the C horizon of soils on stream terraces contains strata of clay loam and loam.

Nobe soils in the Big Horn County Area are mapped only with Absher soils.

Norbert Series

The Norbert series consists of shallow, hilly and moderately steep, steep, and very steep, well-drained soils on dissected sedimentary uplands. Slopes range from 15 to 50 percent. These soils formed in place in material weathered from platy clay shale. Elevation ranges from 3,300 to 4,200 feet.

The native vegetation is western wheatgrass, bluebunch wheatgrass, green needlegrass, blue grama,

white locoweed, and Hoods phlox. Annual precipitation is 14 to 15 inches, the average annual soil temperature is 45° to 47° F, and the frost-free period is 95 to 115 days.

In a representative profile the surface layer is light olive-brown clay about 2 inches thick. The underlying material is light olive-brown and olive clay and channery clay. Platy shale is at a depth of about 19 inches.

Permeability is very slow, and available water capacity is very low. The effective rooting depth is about 20 inches. Most of these soils are used for range, recreation, watershed, and wildlife. A few small areas are used for dryfarmed crops.

Representative profile of Norbert clay, in an area of Norbert-Eltsac clays, hilly, in grassland, 1,980 feet south and 250 feet east of the NW. corner sec. 1, T. 8 S., R. 33 E.

A—0 to 2 inches, light olive-brown (2.5Y 5/4) clay, olive brown (2.5Y 4/4) moist; strong, very fine, granular structure; hard, firm, sticky and very plastic; clear boundary.

C1—2 to 9 inches, light olive-brown (2.5Y 5/4) clay, olive brown (2.5Y 4/4) moist; moderate, medium, granular structure; very hard, firm, very sticky and very plastic; 10 percent (volume) partly weathered shale chips; slightly effervescent; gradual, wavy boundary.

C2—9 to 19 inches, olive (5Y 5/3) channery clay, olive (5Y 4/3) moist; weak, coarse, prismatic structure; very hard, firm, very sticky and very plastic; 40 percent (volume) unweathered shale chips that are 5/2 and 5/4 dry; strongly effervescent; gradual, wavy boundary.

C3—19 to 30 inches, unweathered platy shale; few fine roots between plates.

Depth to fractured platy shale ranges from 10 to 20 inches. The soil is 50 to 60 percent clay throughout. Hue is 2.5Y to 5Y throughout. The C horizon ranges from 5 to 30 percent shale fragments.

Norbert-Eltsac clays, hilly (NH).—This complex is made up of hilly and moderately steep soils on dissected clay shale uplands. It is 65 to 80 percent Norbert clay and 20 to 30 percent Eltsac clay. Slopes are mostly 15 to 25 percent, but they range to 35 percent. Local relief is 60 to 150 feet. The Norbert soil in this complex has the profile described as representative of the Norbert series. It is on smooth ridges, hilltops, and side slopes. The Eltsac soil is on narrow ridges and side slopes. Included in mapping are areas of Shale outcrop at the bottoms of eroding drainageways and on points of ridges.

Runoff is rapid, and the hazard of erosion is severe. These soils are suited to range, wildlife, recreation, and watershed. Capability unit VIe–1 dryland; Thin Hilly range site, 15- to 19-inch precipitation zone; windbreak suitability group 4.

Norbert-Shale outcrop complex, steep (NK).—This complex is made up of steep and very steep soils on deeply dissected clay shale uplands. It is 40 to 65 percent Norbert clay, 25 to 40 percent Shale outcrop, and 5 to 15 percent Eltsac clay and Maginnis channery loam. Slopes are mostly 15 to 35 percent, but they range to 45 percent. Local relief is 75 to 200 feet. The ridges are narrow, and the drainageways are deep and actively eroding. Shale outcrop occurs on all parts of the terrain. The Norbert soil is on wide ridges and side slopes. Shale outcrop is on the south faces of deep drainageways, narrow ridges, and hills. It has slopes of 45 to 75 percent.

Runoff is rapid, and the hazard of erosion is severe. Runoff water carries large amounts of sediment. These soils are suited to range, wildlife, recreation, and watershed. Capability unit VIIe–1 dryland; Shallow Clay range site, 15- to 19-inch precipitation zone; windbreak suitability group 4.

Nunn Series

The Nunn series consists of deep, nearly level to moderately steep, well-drained soils on fans, terraces, and foot slopes in valleys along intermittent streams. Slopes range from 0 to 15 percent. These soils formed in silty clay loam alluvium. Elevation ranges from 3,300 to 3,700 feet.

The native vegetation is mainly blue grama, green needlegrass, western wheatgrass, and silver sagebrush. Annual precipitation is 14 to 15 inches, the average annual soil temperature is 47° F, and the frost-free period is 105 to 120 days.

In a representative profile the surface layer is grayish-brown silty clay loam about 8 inches thick. The subsoil is grayish-brown and light olive-brown silty clay and clay loam about 15 inches thick. The substratum is light brownish-gray, light yellowish-brown, and pale-yellow, stratified clay loam, sandy clay loam, and silt loam that extends to a depth of 60 inches or more.

Permeability is slow, and available water capacity is moderate or high. The effective rooting depth is 60 inches or more. These soils are used for dryfarmed crops, wildlife, recreation, watershed, and range. They are suitable for irrigation.

Representative profile of Nunn silty clay loam, 1 to 4 percent slopes, in a cultivated field, 1,750 feet west and 200 feet south of the NE. corner sec. 26, T. 1 N., R. 38 E.

Ap1—0 to 3 inches, grayish-brown (2.5Y 5/2) silty clay loam, very dark grayish brown (2.5Y 3/2) moist; weak, coarse, blocky structure; slightly hard, friable, slightly sticky and plastic; abrupt, smooth boundary.

Ap2—3 to 8 inches, grayish-brown (2.5Y 5/2) silty clay loam, very dark grayish brown (2.5Y 3/2) moist; weak, coarse, blocky structure; hard, friably, sticky and plastic; abrupt, smooth boundary.

B21t—8 to 13 inches, grayish-brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; moderate, medium, prismatic structure parting to strong, medium, blocky; very hard, firm, very sticky and very plastic; moderately thick, patchy clay films on peds; clear, smooth boundary.

B22t—13 to 17 inches, light olive-brown (2.5Y 5/4) silty clay, olive brown (2.5Y 4/4) moist; moderate, medium, prismatic structure parting to strong, medium, blocky; very hard, firm, very sticky and very plastic; thin, patchy clay films on peds; clear, wavy boundary.

B3—17 to 23 inches, light olive-brown (2.5Y 5/4) clay loam, olive brown (2.5Y 4/4) moist; moderate, medium, subangular blocky structure; very hard, firm, sticky and very plastic; strongly effervescent; clear, wavy boundary.

C1ca—23 to 36 inches, light brownish-gray (2.5Y 6/2) clay loam, light olive brown (2.5Y 5/4) moist; massive; hard, friable, sticky and plastic; strongly effervescent; common fine lime threads and few lime masses; clear, wavy boundary.

C2—36 to 44 inches, light yellowish-brown (2.5Y 6/4) sandy clay loam, light olive brown (2.5Y 5/4) moist; massive; hard, friable, slightly sticky and plastic; strongly effervescent; gradual, wavy boundary.

C3—44 to 60 inches, pale-yellow (2.5Y 7/4) silt loam, light olive brown (2.5Y 5/4) moist; massive; hard, friable, nonsticky and slightly plastic; strongly effervescent.

The dark-colored surface layer ranges from 7 to 17 inches in thickness. The A and B horizons range from 12 to 23 inches in combined thickness. The soil profile typically contains less than 5 percent coarse fragments but ranges from 0 to 10 percent. The A horizon, 3 to 8 inches thick, has hue of 2.5Y or 10YR and chroma of 2 or 3. It is grayish brown, dark grayish brown, and brown. The B2t horizon is olive-brown, light olive-brown, and brown silty clay or heavy clay loam. The C horizon is light brownish gray, pale brown, light yellowish brown, and pale yellow.

Nunn silty clay loam, 0 to 1 percent slopes (Nm).—This nearly level soil is on terraces. In places old channel scars make local relief of 1 foot to 2 feet. The soil has a profile similar to the one described as representative of the series, but it is less sloping. Included in mapping are spots of soils that have a water table at a depth of 5 to 6 feet and a surface layer of silt loam.

Runoff is slow, and the hazard of erosion is slight. This soil is suited to irrigated and dryfarmed crops, hay, wildlife, and range. Capability unit IIIs–3 dryland, IIs–1 irrigated; Clayey range site, 10- to 14-inch precipitation zone; windbreak suitability group 1.

Nunn silty clay loam, 1 to 4 percent slopes (Nn).—This nearly level and gently sloping soil is on fans and terraces. Shallow drainageways on the fans make local relief of 1 foot to 3 feet. The soil has the profile described as representative of the series. Included in mapping are some areas of soils that have a surface layer of silt loam.

Runoff is slow, and the hazard of erosion is slight. This soil is suited to irrigated and dryfarmed crops, hay, wildlife, and range. Capability unit IIIe–2 dryland, IIe–1 irrigated; Clayey range site, 10- to 14-inch precipitation zone; windbreak suitability group 1.

Nunn silty clay loam, 4 to 8 percent slopes (No).—This gently sloping soil is in 5- to 25-acre areas on fans and foot slopes. Slopes are 4 to 5 percent on the fans and 7 to 8 percent on the foot slopes. The soil has a profile similar to the one described as representative of the series, but it is steeper. Included in mapping are small areas of Midway silty clay loam.

Runoff is medium, and the hazard of erosion is moderate. Most areas on foot slopes receive runoff from soils above them. This soil is suited to irrigated and dryfarmed crops, hay, wildlife, and range. Capability unit IIIe–2 dryland, IIIe–1 irrigated; Clayey range site, 10- to 14-inch precipitation zone; windbreak suitability group 1.

Nunn silty clay loam, 8 to 15 percent slopes (Nr).—This strongly sloping soil is on broad ridges that are separated by shallow tributary drainageways. Slopes are mostly 10 to 15 percent and 75 to 200 feet long. The soil has a profile similar to the one described as representative of the series, but it is steeper and in places shale is at a depth of 40 inches.

Included with this soil in mapping are areas of Midway silty clay loam on narrow ridges and the steep sides of deep drainageways.

Runoff is rapid, and the hazard of erosion is severe. This soil is suited to wildlife, range, hay, pasture, and dryfarmed crops. Capability unit IVe–3 dryland; Clayey range site, 10- to 14-inch precipitation zone; windbreak suitability group 1.

Nunn-Midway silty clay loams, 4 to 15 percent slopes (NS).—This complex is made up of gently sloping and strongly sloping soils in the sedimentary uplands. It is about 55 percent Nunn silty clay loam, 25 percent Midway silty clay loam, and 20 percent small areas of Thedalund loam, Wages loam, and Wibaux channery loam. The Nunn soil is on fans and foot slopes and in valleys. It has slopes of 4 to 10 percent that range from 50 to 200 feet long. The Midway soil is on knolls and ridges. It has slopes of 10 to 15 percent. The Nunn and Midway soils in this complex have profiles similar to the ones described as representative of their respective series, but the Nunn soil is steeper, and the Midway soil is less sloping.

Runoff is medium, and the hazard of erosion is moderate. Most areas receive runoff from soils above them. These soils are suited to watershed, wildlife, range, hay, and pasture. Capability unit IVe–3 dryland; Clayey range site, 10- to 14-inch precipitation zone; windbreak suitability group 1.

Olney Series

The Olney series consists of deep, gently sloping to strongly sloping, well-drained soils on fans and at the heads of drainageways. Slopes range from 4 to 12 percent. These soils formed in sandy alluvium weathered from calcareous sandstone. Elevation ranges from 3,000 to 3,600 feet.

The native vegetation is mainly blue grama, needleandthread, prairie sandreed, green sagewort, and fringed sagewort. Annual precipitation is 13 to 14 inches, the average annual soil temperature is 48° to 49° F, and the frost-free period is 115 to 120 days.

In a representative profile the surface layer is grayish-brown fine sandy loam about 3 inches thick. The subsoil is grayish-brown, dark grayish-brown, light yellowish-brown, and light-gray sandy loam and sandy clay loam about 34 inches thick. The substratum is light-gray and pale-yellow sandy loam that extends to a depth of 62 inches or more.

Permeability and available water capacity are moderate. The effective rooting depth is 60 inches or more. These soils are used for range, wildlife, recreation, watershed, and dryfarmed crops.

Representative profile of Olney fine sandy loam, 4 to 12 percent slopes, in grassland, 200 feet north and 300 feet east of the center of sec. 13, T. 9 S., R. 40 E.

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

B1—3 to 6 inches, grayish-brown (10YR 5/2) sandy loam, dark grayish brown (10YR 4/2) moist; weak, coarse, prismatic structure; slightly hard, friable, nonsticky and slightly plastic; many fine roots; clear, smooth boundary.

B21t—6 to 13 inches, dark grayish-brown (10YR 4/2) sandy clay loam, very dark grayish brown (10YR 3/2) moist; strong, coarse, prismatic structure; hard,

firm, sticky and plastic; common fine and very fine roots; common fine and micro pores; clay bridges between sand grains; gradual, wavy boundary.

B22t—13 to 18 inches, grayish-brown (10YR 5/2) light sandy clay loam, dark brown (10YR 4/3) moist; strong, coarse, prismatic structure; hard, firm, slightly sticky and plastic; few fine roots; common fine pores; thin clay bridges between sand grains; gradual, wavy boundary.

B23t—18 to 25 inches, light yellowish-brown (2.5Y 6/4) light sandy clay loam, light olive brown (2.5Y 5/4) moist; moderate, coarse, prismatic structure; hard, friable, slightly sticky and slightly plastic; few fine roots; many very fine and micro pores; few thin clay bridges between sand grains; gradual, wavy boundary.

B3—25 to 37 inches, light-gray (2.5Y 6/2) sandy loam, light olive brown (2.5Y 5/4) moist; weak, coarse, prismatic structure; slightly hard, friable, slightly sticky and slightly plastic; few fine roots; few fine pores; gradual, wavy boundary.

C1—37 to 47 inches, light-gray (2.5Y 6/2) sandy loam, light olive brown (2.5Y 5/4) moist; massive; soft, friable, nonsticky and slightly plastic; few roots; slightly effervescent; clear, wavy boundary.

C2ca—47 to 62 inches, pale-yellow (2.5Y 7/4) heavy sandy loam, light yellowish brown (2.5Y 6/4) moist; massive; hard, friable, slightly sticky and plastic; strongly effervescent; soft lime masses.

Depth to calcareous material ranges from 14 to 38 inches. The A and B horizons range from 14 to 37 inches in combined thickness. The A1 horizon is grayish brown and light brownish gray in hue of 10YR or 2.5Y. The B2t horizon is grayish brown, yellowish brown, and light gray. The C horizon is light gray, pale yellow, and pale olive in hue of 2.5Y or 5Y.

Olney fine sandy loam, 4 to 12 percent slopes (On).—This soil is on fans, terraces, and foot slopes. Slopes range from 300 to 500 feet long.

Included with this soil in mapping are areas, ½ to 1 acre in size, of soils that have a surface layer of loamy sand and patches, 1 acre to 2 acres in size, of Terry sandy loam. Also included are areas of soils that are calcareous at a depth of 9 inches and that have a subsoil of sandy clay loam.

Runoff is medium, and the hazard of erosion is moderate. This soil is suited to dryfarmed crops, hay, wildlife, watershed, recreation, and range. Capability unit IIIe–3 dryland; Sandy range site, 10- to 14-inch precipitation zone; windbreak suitability group 2M.

Parshall Series

The Parshall series consists of deep, gently sloping to strongly sloping and rolling, well-drained soils on foot slopes and fans and in valleys in the sandstone uplands. Slopes range from 4 to 15 percent. These soils formed in sandy loam alluvium. Elevation ranges from 3,400 to 3,800 feet.

The native vegetation is mainly prairie sandreed, little bluestem, silver sagebrush, and cudweed sagewort. Annual precipitation is 14 to 16 inches, the average annual soil temperature is 46° to 47° F, and the frost-free period is 105 to 115 days.

In a representative profile the surface layer is grayish-brown fine sandy loam about 2 inches thick. The subsoil is grayish-brown and dark-brown sandy loam about 17 inches thick. The substratum is grayish-brown and light brownish-gray sandy loam and sandy clay loam that extends to a depth of 60 inches or more.

Permeability is moderately rapid, and available water capacity is moderate. The effective rooting depth is 60 inches or more. These soils are used for range, wildlife, recreation, watershed, and dryfarmed crops.

Representative profile of Parshall fine sandy loam, 4 to 8 percent slopes, in grassland, 1,980 feet east and 200 feet north of the SW. corner sec. 2, T. 4 S., R. 37 E.

A1—0 to 2 inches, grayish-brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak, coarse, granular structure; soft, very friable, nonsticky and slightly plastic; many very fine and fine roots; clear, smooth boundary.

B21—2 to 6 inches, grayish-brown (10YR 5/2) sandy loam, dark grayish brown (10YR 3/2) moist; weak, coarse, prismatic structure; slightly hard, friable, nonsticky and slightly plastic; common fine and very fine roots; clear, smooth boundary.

B22—6 to 19 inches, dark-brown (10YR 4/2) heavy sandy loam, very dark grayish brown (10YR 3/2) moist; moderate, coarse, prismatic structure; slightly hard, friable, slightly sticky and slightly plastic; common fine and very fine roots; diffuse, smooth boundary.

C1—19 to 26 inches, grayish-brown (2.5Y 4/2) sandy loam, very dark grayish brown (2.5Y 3/2) moist; weak, coarse, prismatic structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots; clear, wavy boundary.

C2—26 to 38 inches, light brownish-gray (2.5Y 6/2) sandy loam, olive brown (2.5Y 4/4) moist; massive; slightly hard, friable, nonsticky and slightly plastic; few very fine roots; few fine pores; slightly effervescent; gradual, wavy boundary.

C3—38 to 60 inches, light brownish-gray (10YR 6/2) sandy clay loam, light olive brown (2.5Y 5/4) moist; massive; hard, friable, slightly sticky and plastic; few fine roots; few fine pores; slightly effervescent; few fine, soft lime masses.

Depth to carbonates ranges from 15 to 40 inches. The dark-colored surface layer ranges from 20 to 28 inches in thickness. Between depths of 10 and 40 inches the soil ranges from 10 to 18 percent clay. The A and B horizons are grayish brown, dark grayish brown, and dark brown. The C horizon is grayish brown, light brownish gray, and light yellowish brown.

Parshall fine sandy loam, 4 to 8 percent slopes (Pa).—This sloping soil is on foot slopes and in swales in the hilly sandstone uplands. Areas range from 15 to 25 acres in size. Slopes range from 150 to 500 feet long. Included in mapping are areas of Ascalon sandy loam.

Runoff is medium, and the hazard of erosion is moderate. This soil is suited to dryfarmed crops, hay, wildlife, watershed, recreation, and range. Capability unit IIIe–2 dryland; Sandy range site, 15- to 19-inch precipitation zone; windbreak suitability group 1.

Peritsa Series

The Peritsa series consists of moderately deep, undulating and rolling, well-drained soils on hills and ridges in the shale uplands. Slopes are mostly 4 to 15 percent, but they range to 20 percent. These soils formed in place in material weathered from red shale. Elevation ranges from 3,900 to 5,000 feet.

The native vegetation is mainly silver sagebrush, western wheatgrass, fringed sagewort, Sandberg bluegrass, and broom snakeweed. Annual precipitation is 15 to 16 inches, the average annual soil temperature

is 45° to 46° F, and the frost-free period is 90 to 110 days.

In a representative profile the surface layer is reddish-brown silt loam about 3 inches thick. The subsoil is reddish-brown and red silty clay loam about 11 inches thick. The substratum is light-red silty clay loam that contains unweathered shale chips in the lower part. Shale is at a depth of about 31 inches.

Permeability is moderate, and available water capacity is low or moderate. The effective rooting depth is 30 to 40 inches. These soils are used for range, wildlife, recreation, watershed, and dryfarmed crops.

Representative profile of Peritsa silt loam, undulating, in grassland, 300 feet north and 150 feet east of the SW. corner sec. 35, T. 6 S., R. 28 E.

A1—0 to 3 inches, reddish-brown (5YR 4/4) silt loam, dark reddish brown (5YR 3/2) moist; moderate, medium, granular structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; few very fine interstitial pores; clear, smooth boundary.

B1—3 to 6 inches, reddish-brown (5YR 4/3) silty clay loam, dark reddish brown (5YR 3/3) moist; moderate, medium, prismatic structure parting to moderate, medium, blocky; hard, friable, slightly sticky and plastic; many very fine roots; few very fine pores; clear, smooth boundary.

B2—6 to 9 inches, reddish-brown (2.5YR 5/4) silty clay loam, dark reddish brown (2.5YR 3/4) moist; moderate, medium, prismatic structure parting to medium, coarse, blocky; hard, friable, sticky and plastic; many very fine roots; common very fine tubular pores; clear, smooth boundary.

B3—9 to 14 inches, red (2.5YR 5/6) silty clay loam, reddish brown (2.5YR 4/4) moist; moderate, medium, prismatic structure parting to moderate, medium, blocky; hard, friable, sticky and plastic; many very fine roots; many very fine tubular pores; 2 percent fine unweathered shale chips; strongly effervescent; clear, wavy boundary.

C1ca—14 to 24 inches, light-red (2.5YR 6/6) silty clay loam, reddish brown (2.5YR 4/4) moist; massive; very hard, firm, sticky and plastic; few fine roots; many very fine tubular pores; 2 percent fine shale chips; strongly effervescent; many fine and medium, white lime threads; gradual boundary.

C2—24 to 31 inches, light-red (2.5YR 6/6) silty clay loam, red (2.5YR 4/6) moist; massive; very hard, firm, sticky and plastic; few very fine roots; many very fine tubular pores; 10 percent shale chips; strongly effervescent; few fine, white lime threads; gradual boundary.

C3—31 to 38 inches, light-red (2.5YR 6/6) partly weathered shale; strongly effervescent; diffuse boundary.

C4—38 to 68 inches, soft, red, calcareous, platy shale.

Depth to shale ranges from 20 to 40 inches. The A and B2 horizons range from 8 to 15 inches in combined thickness. Between depths of 10 and 40 inches, the soil is silty clay loam or silt loam. The A horizon is reddish brown, weak red, or reddish gray. The B2 horizon is reddish brown, pale red, or light reddish brown and pinkish gray. The Cca horizon is light red, pale red, or reddish yellow.

Peritsa silt loam, undulating (Pd).—This undulating soil is on hills and ridges and at the heads of drainageways. Slopes are 4 to 8 percent. This soil has the profile described as representative of the series.

Included with this soil in mapping are areas of soils that have a surface layer of channery loam. Also included are areas of Abac channery loam, Rock outcrop, and Rottulee silt loam.

Runoff is medium, and the hazard of erosion is moderate. This soil is suited to wildlife, recreation, watershed, range, hay, and limited dryfarmed crops. Rock outcrop interferes with normal tillage. Capability unit IIIe–2 dryland; Silty range site, 15- to 19-inch precipitation zone; windbreak suitability group 2M.

Peritsa-Abac loams, rolling (PE).—This complex is made up of rolling and moderately steep soils in the sedimentary uplands. It is about 70 percent Peritsa silt loam, 20 percent Abac loam, and 10 percent Rock outcrop. Slopes are mostly 8 to 15 percent, but they range to 20 percent. The Peritsa soil is on smooth ridges and hills and has slopes of 8 to 12 percent. The Abac soil is on narrow ridges and side slopes and has slopes of 15 to 20 percent. Rock outcrop is along drainageways and on points of ridges. The Peritsa and Abac soils in this complex have profiles similar to the ones described as representative of their respective series, but they are steeper. Included in mapping are areas of soils that have sandstone boulders covering 10 percent of the soil surface.

Runoff is rapid, and the hazard of erosion is severe. These soils are suited to wildlife, recreation, watershed, range, and pasture. Capability unit IVe–2 dryland; Silty range site, 15- to 19-inch precipitation zone; windbreak suitability group 4.

Peritsa complex, rolling (PF).—This complex is made up of rolling soils in the sedimentary uplands. It is about 60 percent Peritsa silt loam and 40 percent Fergus and Twin Creek silt loams. Slopes are 8 to 15 percent. The Peritsa soil is at the bases of steep hills and on low ridges that slope to the valley floor. The Twin Creek soil is below the Peritsa soil and between the ridges. The Fergus soil is in valleys and on fans. It has slopes of 8 to 10 percent. The soils in this complex have profiles similar to the ones described as representative of their respective series, but they are steeper.

Runoff is medium, and the hazard of erosion is moderate. Most areas receive runoff from soils above them. These soils are suited to range, wildlife, recreation, watershed, and pasture. Capability unit IVe–2 dryland; Silty range site, 15- to 19-inch precipitation zone; windbreak suitability group 1.

Pierre Series

The Pierre series consists of moderately deep, gently undulating to hilly and steep, well-drained soils in the sedimentary uplands. Slopes are mostly 2 to 35 percent, but they range to 1 percent. These soils formed in material weathered in place from platy clay shale. Elevation ranges from 3,000 to 3,800 feet.

The native vegetation is mainly green needlegrass, big sagebrush, western wheatgrass, white loco, curlycup gumweed, and Hoods phlox. Annual precipitation is 13 to 14 inches, the average annual soil temperature is 47° to 49° F, and the frost-free period is 110 to 125 days.

In a representative profile the surface layer is grayish-brown silty clay and clay about 3 inches thick. The subsoil is light brownish-gray clay about 3 inches thick. The substratum is pale-olive clay. Platy clay shale is at a depth of about 29 inches.

Permeability is very slow, and available water capacity is low. The effective rooting depth is 20 to 40 inches. These soils are used for range, wildlife, recreation, watershed, and dryfarmed crops.

Representative profile of Pierre clay, rolling, in grassland, 1,320 feet north and 250 feet east of the SW. corner sec. 10, T. 1 S., R. 35 E.

A11—0 to 1 inch, grayish-brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; moderate, very fine, granular structure; hard, firm, sticky and very plastic; slightly effervescent; clear smooth boundary .

A12—1 inch to 3 inches, grayish-brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; weak, medium, blocky structure; very hard, firm, very sticky and very plastic; common fine and medium tubular pores; slightly effervescent; clear boundary.

B—3 to 6 inches, light brownish-gray (2.5Y 6/2) clay, dark grayish brown (2.5Y 4/2) moist; weak, medium, prismatic structure parting to moderate, fine, blocky; extremely hard, very firm, very sticky and very plastic; common fine and medium tubular pores; strongly effervescent; clear boundary.

C1—6 to 17 inches, pale-olive (5Y 6/3) clay, olive (5Y 5/3) moist; weak, medium, prismatic structure parting to moderate, fine and medium, blocky; extremely hard, very firm, very sticky and very plastic; common fine and few medium tubular pores; strongly effervescent; few medium, light-gray lime masses; clear, wavy boundary.

C2—17 to 23 inches, pale-olive (5Y 6/3) clay, olive (5Y 5/3) moist; weak, coarse, blocky structure; very hard, firm, very sticky and very plastic; indistinct slickensides; few fine and medium tubular pores; few fine clusters of gypsum crystals; strongly effervescent; gradual, wavy boundary.

C3cs—23 to 29 inches, pale-olive (5Y 6/3) clay, olive (5Y 4/3) moist; massive; very hard, firm, very sticky and very plastic; few fine tubular pores; few fine clusters of gypsum crystals; few partly weathered shale chips; strongly effervescent; gradual, wavy boundary.

R—29 to 41 inches, thin, platy clay shale; light olive-brown (2.5Y 5/5) iron stains along fracture planes.

Depth to shale ranges from 20 to 40 inches. Hue is 2.5Y or 5Y throughout, and chroma is 2 or 3. Between depths of 10 and 40 inches, the soil ranges from 60 to 70 percent clay. The A horizon is grayish brown, light brownish gray, and olive gray. The B horizon and the upper part of the C horizon develop ½- to 2-inch cracks when dry. The C horizon is pale olive, light olive gray, and light yellowish brown. The lower part of the C horizon is 5 to 30 percent shale chips.

Pierre clay, undulating (Pg).—This undulating soil is on shale hills and ridges in the sedimentary uplands. Areas range from 20 to 120 acres in size. Slopes are 4 to 5 percent on ridgetops, in swales, and at the heads of drainageways and 6 to 8 percent on the sides of deep drainageways. The soil has a profile similar to the one described as representative of the series, but it is less sloping. Included in mapping are areas of Shale outcrop and Lismas clay on the points of ridges between deep drainageways.

Runoff is medium, and the hazard of erosion is moderate. This soil is used for dryfarmed crops, pasture, wildlife, recreation, watershed, and range. Capability unit IVe–3 dryland; Clayey range site, 10- to 14-inch precipitation zone; windbreak suitability group 2M.

Pierre clay, rolling (Ph).—This rolling soil is on hills and ridges in the shale uplands. Areas range from 20 to 200 acres in size. Slopes are 8 to 15 percent. The soil has the profile described as representative of the series. Included in mapping are small areas of Lismas clay and Kyle clay.

Runoff is rapid, and the hazard of erosion is severe. This soil is suited to range, wildlife, recreation, and watershed. Capability unit VIe–1 dryland; Clayey range site, 10- to 14-inch precipitation zone; windbreak suitability group 2M.

Pierre-Kyle clays, gently undulating (Pk).—This complex is made up of gently undulating soils in the sedimentary uplands. It is about 75 percent Pierre clay and 25 percent Kyle clay. Slopes are mostly 2 to 4 percent, but they range to 1 percent. The Pierre soil is on the convex slopes of knolls and ridges. The Kyle soil is in 3- to 5-acre patches on concave slopes at the heads of drainageways and between ridges. The Kyle soil in this complex has a profile similar to the one described as representative of the Kyle series, but shale bedrock is at a depth of 40 to 50 inches.

Runoff is slow, and the hazard of erosion is moderate. These soils are suited to dryfarmed crops, pasture, wildlife, recreation, watershed, and range. Capability unit IVs–2 dryland; Clayey range site, 10- to 14-inch precipitation zone; windbreak suitability group 2M.

Pierre-Lismas clays, rolling (PM).—This complex is made up of rolling soils in the sedimentary uplands. It is about 70 percent Pierre clay, 20 percent Lismas clay, and 10 percent Kyle clay. The Pierre soil is on wide ridges, hills, and side slopes of drainageways. It has slopes of 8 to 12 percent. The Lismas soil is on narrow ridges and side slopes of deep drainageways. It has slopes of 12 to 20 percent. Included in mapping are spots of old gravelly terrace material.

Runoff is rapid, and the hazard of erosion is severe. These soils are suited to range, recreation, watershed, and wildlife. Capability unit VIe–1 dryland; Clayey range site, 10- to 14-inch precipitation zone; windbreak suitability group 3M.

Pierre-Lismas clays, hilly (PN).—This complex is made up of hilly and steep soils in the sedimentary uplands. It is 50 to 75 percent Lismas clay, 20 to 50 percent Pierre clay, and 5 to 15 percent Shale outcrop. Slopes are mostly 15 to 25 percent, but they range to 45 percent. Most areas have a narrow central ridge and spur ridges that slope steeply to the valley bottoms. Narrow drainageways separate the spur ridges. Local relief ranges from 75 to 200 feet. The Lismas soil is on steep, narrow ridges and sides of drainageways. It has slopes of 25 to 45 percent. The Pierre soil is on wide ridges and at the heads of drainageways. It has slopes of 15 to 20 percent. The Pierre and Lismas soils in this complex have profiles similar to the one described as representative of their respective series, but they are steeper. Included in mapping are spots of Harvey loam.

Runoff is rapid, and the hazard of erosion is severe. These soils are suited to range, wildlife, recreation, and watershed. Capability unit VIe–1 dryland; Thin Hilly range site, 10- to 14-inch precipitation zone; windbreak suitability group 4.

Pultney Series

The Pultney series consists of moderately deep,

undulating to very steep, well-drained soils in the sedimentary uplands. Slopes are mostly 4 to 65 percent, but they range to 2 percent. These soils formed in place in loam material weathered from calcareous, interbedded shale and sandstone. Elevation ranges from 4,000 to 5,300 feet.

The native vegetation is mainly bluebunch wheatgrass, Hoods phlox, needleandthread, and big sagebrush. Annual precipitation is 11 to 13 inches, the average annual soil temperature is 47° to 49° F, and the frost-free period is 100 to 110 days.

In a representative profile the surface layer is brown loam about 2 inches thick. The subsoil is brown loam about 4 inches thick. The substratum is light-brown loam that grades to pink loam. Shale and sandstone are at a depth of about 30 inches. A few fragments of sandstone, shale, and limestone are scattered on the surface and throughout the soil.

Permeability is moderate, and available water capacity is low. The effective rooting depth is about 30 inches. These soils are used for range, wildlife, recreation, watershed, and crops.

Representative profile of Pultney loam, in an area of Pultney-Neville association. undulating, in grassland, 1,320 feet west and 1,200 feet south of the NE. corner sec. 22, T. 8 S., R. 29 E.

A1—0 to 2 inches, brown (10YR 5/3) loam, dark brown (10YR 3/3) moist; moderate, medium, platy structure; soft, friable, slightly sticky and slightly plastic; few fine rock chips, 1/16 to 1 inch in diameter, on surface; clear, smooth boundary.

B—2 to 6 inches, brown (7.5YR 5/3) loam, dark brown (7.5YR 4/3) moist; weak, coarse, prismatic structure; hard, friable, sticky and slightly plastic; clear, wavy boundary.

C1—6 to 12 inches, light-brown (7.5YR 6/3) loam, brown (7.5YR 5/4) moist; weak, coarse, prismatic structure; hard, friable, sticky and plastic; strongly effervescent; few fine, indistinct lime masses; gradual, wavy boundary.

C2ca—12 to 19 inches, pink (7.5YR 7/3) loam, light brown (7.5YR 6/4) moist; massive; hard, friable, sticky and plastic; violently effervescent; few fine, soft lime masses; clear, wavy boundary.

C3ca—19 to 30 inches, pink (7.5YR 8/3) loam, pink (7.5YR 7/4) moist; massive; hard, friable, slightly sticky and slightly plastic; violently effervescent; few fine, soft lime masses; few fine limestone fragments; clear, wavy boundary.

C4—30 to 52 inches, purple and pink shale and noncalcareous, white sandstone.

Depth to shale and sandstone ranges from 20 to 40 inches. The soil ranges from 0 to 15 percent coarse fragments throughout. The soil is brown, pale brown, grayish brown, and light brown in hue of 10YR or 7.5YR throughout. Between depths of 10 and 30 inches, the soil ranges from 20 to 30 percent clay. The Cca horizon is pink and very pale brown.

Pultney-Neville association, undulating (PO).—This association is made up of undulating soils in the sedimentary uplands. It is about 45 percent Pultney loam, 40 percent Neville loam, and 15 percent Harvey loam. Slopes are mostly 4 to 8 percent, but they range to 2 percent. The soils are intermixed, but the Neville soil can be identified by its reddish-brown surface layer. Included in mapping are areas of Travessilla sandy loam, on which sandstone is exposed at the surface.

Runoff is medium, and the hazard of erosion is moderate. These soils are suited to range, wildlife, recreation, watershed, hay, and dryfarmed crops. Capability unit IIIe–3 dryland; Silty range site, 10- to 14-inch precipitation zone; windbreak suitability group 3L.

Quietus Series

The Quietus series consists of moderately deep, moderately steep to very steep, well-drained soils on ridges and hills in the sedimentary highlands. Slopes range from 15 to 45 percent. These soils formed in place in material weathered from dolomitic limestone. Elevation ranges from 7,000 to 8,500 feet.

The native vegetation is a mixed stand of Engelmann spruce and alpine fir and an understory of oregongrape, huckleberry, and lupine. Annual precipitation is 20 to 24 inches, the average annual soil temperature is 42° to 44° F, and the frost-free period is 60 to 70 days.

In a representative profile the surface layer is brown loam about 3 inches thick. The subsoil is brown and dark-brown loam, clay loam, and gravelly loam about 13 inches thick. The substratum is pale-brown very gravelly loam. Shattered limestone is at a depth of about 27 inches.

Permeability is moderate, and available water capacity is low. The effective rooting depth is 40 inches. These soils are used for timber production, game range, watershed, and recreation.

Representative profile of Quietus loam, in timber land, 1,320 feet west and 400 feet south of the NE. corner sec. 35, T. 9 S., R. 31 E.

O—2 inches to 0, partly decomposed, matted spruce and fir needles and twigs.

A2—0 to 3 inches, brown (10YR 5/3) loam, dark brown (10YR 3/3) moist; strong, thin, platy structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots; light brownish-gray (10YR 6/2) coatings of clear sand and silt grains on peds; clear, smooth boundary.

B21t—3 to 7 inches, brown (10YR 5/3) heavy loam, dark yellowish brown (10YR 3/4) moist; weak, medium, prismatic structure parting to weak, fine, blocky; hard, friable, slightly sticky and plastic; common very fine roots; many very fine tubular pores; common clear sand and silt grains coating the larger peds; thin clay bridges between sand grains and thin clay coatings in pores; gradual, wavy boundary.

B22t—7 to 11 inches, dark-brown (10YR 4/3) heavy clay loam, dark yellowish brown (10YR 3/4) moist; weak, medium, prismatic structure parting to moderate, medium, blocky; very hard, firm, very sticky and very plastic; few very fine roots; common very fine tubular pores; very thin, continuous clay films on peds; diffuse, wavy boundary.

B23t—11 to 16 inches, brown (10YR 5/3) gravelly heavy loam, dark brown (10YR 4/3) moist; weak, fine, blocky structure; hard, friable, sticky and plastic; few very fine roots; common very fine tubular pores; thin clay bridges between sand grains and thin clay films on walls of pores; 20 percent fine limestone fragments of gravel size; gradual, wavy boundary.

C—16 to 27 inches, pale-brown (10YR 6/3) very gravelly loam, brown (10YR 5/3) moist; massive; hard, friable, slightly sticky and plastic; few very fine roots; 40 percent dolomite fragments of gravel size; abrupt, wavy boundary.

R—27 inches, shattered dolomite.

Depth to shattered limestone and dolomite ranges from 20 to 40 inches. Hue ranges from 10R to 5YR throughout.

The A horizon and the upper part of the B2 horizon range from 0 to 15 percent coarse fragments of gravel, channer, and stone size, and the lower part of the B horizon and the C horizon, from 15 to 50 percent. The A2 horizon is grayish brown and dark grayish brown. The B2t horizon is clay loam or silty clay loam. The C horizon is pale brown, light brownish gray, and grayish brown.

Quietus loam (QU).—This soil is on ridges and hills in the sedimentary highlands. Areas range from 40 to 300 acres in size. Slopes are smooth on the hillsides, and they are broken by limestone ledges that are 1 foot to 5 feet high. Slopes range from 15 to 45 percent, but they are 25 to 45 percent on the valley sides. Included in mapping are patches of Benteen loam.

Runoff is rapid, and the hazard of erosion is severe. This soil is suited to woodland, game range, watershed, and recreation. The principal tree species are Engelmann spruce, subalpine fir, and Douglas-fir. The average site index for the Douglas-fir is 60.

Timber harvest on this soil is not recommended because of the recreational value of the Big Horn Mountains. The high content of silt and moderate depth of the soil contribute to the severe hazard of erosion where roads are constructed. Most areas are readily accessible to fire-fighting equipment. Windthrow is a hazard on the exposed ridges and hilltops. Capability unit VIe–1 dryland; not placed in a range site or windbreak suitability group.

Raynesford Series

The Raynesford series consists of deep, undulating, well-drained soils on fans in the sedimentary uplands. Slopes range from 4 to 8 percent. These soils formed in strongly calcareous, cobbly and gravelly alluvium derived mainly from limestone and dolomite. Elevation ranges from 5,500 to 7,500 feet.

The native vegetation is mainly green needlegrass, dryland sedges, Idaho fescue, shrubby cinquefoil, wild geranium, rough fescue, and big sage. Annual precipitation is 18 to 20 inches, the average annual soil temperature is 43° to 45° F, and the frost-free period is 60 to 75 days.

In a representative profile the surface layer is dark-brown loam and clay loam about 10 inches thick. The subsoil is pale-brown gravelly clay loam about 11 inches thick. The substratum is very pale brown gravelly clay loam, very gravelly clay loam, and very gravelly loam that is 30 to 60 percent limestone fragments of gravel and cobble size.

Permeability is moderately slow, and available water capacity is moderate. The effective rooting depth is 60 inches or more. These soils are used for range, wildlife, recreation, and watershed.

Representative profile of Raynesford loam, undulating, in grassland, 1,320 feet south and 600 feet west of the NE. corner sec. 6, T. 9 S., R. 32 E.

A11—0 to 4 inches, dark-brown (10YR 3/3) loam, very dark brown (10YR 2/3) moist; moderate, very coarse, granular structure; soft, friable, slightly sticky and slightly plastic; common very fine and micro roots; 10 percent (volume) limestone and chert fragments of gravel size; clear, smooth boundary.

A12—4 to 10 inches, dark-brown (10YR 4/3) light clay loam, dark brown (10YR 3/3) moist; moderate, fine, blocky structure; hard, friable, sticky and plastic; common very fine and micro roots; 10 percent (volume) limestone and chert fragments of gravel size; clear, wavy boundary.

B21—10 to 15 inches, pale-brown (10YR 6/3) gravelly light clay loam, brown (10YR 5/3) moist; weak, medium, prismatic structure parting to moderate, fine, blocky; very hard, firm, very sticky and plastic; few very fine and micro roots; common micro pores; 20 percent (volume) limestone fragments of gravel size; gradual, wavy boundary.

B22—15 to 21 inches, pale-brown (10YR 6/3) gravelly light clay loam, brown (10YR 5/3) moist; weak, fine, blocky structure; very hard, firm, very sticky and plastic; few micro roots; 20 percent (volume) limestone fragments of gravel size; slightly effervescent; clear, wavy boundary.

C1ca—21 to 30 inches, very pale brown (10YR 7/3) gravelly clay loam, pale brown (10YR 6/3) moist; massive; very hard, firm, very sticky and plastic; 30 percent (volume) limestone fragments of gravel size; strongly effervescent; lime coating on gravel; gradual, wavy boundary.

C2ca—30 to 41 inches, very pale brown (10YR 8/3) very gravelly heavy loam, very pale brown (10YR 7/3) moist; massive; hard, firm, sticky and plastic; 50 percent (volume) limestone fragments of gravel size; violently effervescent; lime coatings on gravel; diffuse, wavy boundary.

C3—41 to 49 inches, very pale brown (10YR 8/3) very gravelly clay loam, very pale brown (10YR 7/3) moist; massive; hard, friable, sticky and plastic; 60 percent (volume) limestone fragments of gravel and cobble size; violently efferevscent; lime coatings on gravel and cobbles.

Depth to calcareous material ranges from 6 to 12 inches. The soil between depths of 10 and 40 inches is heavy loam or clay loam. Above a depth of 30 inches, the soil ranges from 5 to 35 percent coarse fragments of limestone, chert, and shale. Hue is 10YR or 7.5YR throughout. The dark-colored surface layer ranges from 8 to 12 inches in thickness. The A1 horizon is dark brown, very dark grayish brown, and dark grayish brown. The Cca horizon is pink and very pale brown.

Raynesford loam, undulating (Ra).—This gently sloping and undulating soil is on wide ridges and hills in the sedimentary uplands. Slopes are 4 to 8 percent. Shallow drainageways make a local relief of 5 to 15 feet. Slopes range from 200 to 500 feet long. Included in mapping are areas of Duncom stony loam that have 20 to 35 percent coarse fragments on the surface.

Runoff is medium, and the hazard of erosion is moderate. This soil is suited to wildlife, recreation, watershed, range, and pasture. Capability unit IVe–2 dryland; Silty range site, 20- to 24-inch precipitation zone; windbreak suitability group 2L.

Reeder Series

The Reeder series consists of moderately deep, undulating to hilly, well-drained soils on hills and ridges in the sedimentary uplands. Slopes range from 2 to 25 percent. These soils formed in place in material weathered from mixed shale and sandstone. Elevation ranges from 3,500 to 6,000 feet.

The native vegetation is mainly Idaho fescue, prairie junegrass, Indian paintbrush, Hoods phlox, lupine, and big sagebrush. Annual precipitation is 14 to 16 inches, the average annual soil temperature is 44° to 47° F, and the frost-free period is 90 to 110 days.

In a representative profile the surface layer is dark grayish-brown loam about 4 inches thick. The subsoil is dark grayish-brown and brown loam and clay loam

about 17 inches thick. The substratum is pale-brown clay loam and loam. Sandy shale and sandstone are at a depth of about 30 inches.

Permeability is moderate, and available water capacity is low. The effective rooting depth is about 30 inches. These soils are used for range, wildlife, recreation, watershed, and dryfarmed crops.

Representative profile of Reeder loam, undulating, in grassland, 2,640 feet south and 1,320 feet west of the NE. corner sec. 26, T. 6 S., R. 29 E.

A1—0 to 4 inches, dark grayish-brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; weak, coarse, platy structure parting to weak, coarse, granular; soft, very friable, slightly sticky and slightly plastic; clear boundary.

B1—4 to 8 inches, dark grayish-brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; weak, medium, prismatic structure parting to weak, medium, subangular blocky; slightly hard, friable, slightly sticky and plastic; clear, wavy boundary.

B21t—8 to 13 inches, brown (10YR 5/3) clay loam, dark brown (10YR 3/3) moist; moderate, medium, prismatic structure parting to moderate medium, blocky; hard, friable, sticky and plastic; thin, patchy clay films on peds; dark grayish-brown (10YR 4/2) organic stains on vertical surfaces of peds; gradual, wavy boundary.

B22t—13 to 21 inches, brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; moderate, medium, prismatic structure parting to moderate, medium, blocky; hard, friable, sticky and plastic; thin, patchy clay films on peds; gradual, wavy boundary.

C1—21 to 25 inches, pale-brown (10YR 6/3) clay loam, dark brown (10YR 4/3) moist; weak, medium, blocky structure; hard, friable, sticky and plastic; clear, wavy boundary.

C2—25 to 30 inches, pale-brown (10YR 6/3) loam, light yellowish brown (10YR 6/4) moist; massive; hard, friable, slightly sticky and slightly plastic; strongly effervescent; abrupt, wavy boundary.

C3—30 to 36 inches, sandy shale and sandstone.

Depth to carbonates ranges from 10 to 26 inches, and depth to fine-grained sandstone and shale, from 20 to 40 inches. The soil ranges from 0 to 15 percent coarse fragments throughout. The dark-colored surface layer ranges from 8 to 12 inches in thickness. The A1 horizon is loam or silt loam. It is dark grayish brown, grayish brown, and brown in hue of 10YR or 7.5YR. The B2t horizon ranges from 22 to 35 percent clay. It is brown, grayish brown, and light olive brown in hue of 10YR or 2.5Y. The C horizon is pale brown, light gray, and light brownish gray.

Reeder loam, gently undulating (Rda).—This gently undulating soil is on broad ridges in the sedimentary uplands. Slopes are 2 to 4 percent. The soil has a profile similar to the one described as representative of the series, but it is less sloping. Included in mapping are patches of Rentsac gravelly loam and Farnuf loam.

Runoff is slow, and the hazard of erosion is slight. This soil is used for dryfarmed crops, hay, wildlife, recreation, watershed, and range. Capability unit IIe–2 dryland; Silty range site, 15- to 19-inch precipitation zone; windbreak suitability group 2M.

Reeder loam, undulating (Rdb).—This undulating soil is on broad ridges between major drainageways in the sedimentary uplands. Slopes are mostly 4 to 8 percent. The ridges are 175 to 250 feet wide, and side slopes are 200 to 300 feet long. Shallow drainageways make local relief of 25 to 30 feet. In places ledges of hard sandstone, 1 foot to 2 feet high, crop out on steep hillsides. The soil has the profile described as representative of the series. Included in mapping are narrow areas of Farnuf loam and Arnegard loam.

Runoff is medium, and the hazard of erosion is moderate. This soil is used for dryfarmed crops, hay, wildlife, recreation, watershed, and range. Capability unit IIIe–2 dryland; Silty range site, 15- to 19-inch precipitation zone; windbreak suitability group 2M.

Reeder loam, hilly (Rdc).—This hilly soil is on the sides of long ridges in the sedimentary uplands. Slopes are mostly 15 to 25 percent, but they range to 35 percent. They range from 150 to 300 feet long. The soil has a profile similar to the one described as representative of the series, but it is steeper. Included in mapping are areas of Arnegard loam and Lap channery loam.

Runoff is rapid, and the hazard of erosion is severe. This soil is suited to range, watershed, recreation, and wildlife. Capability unit VIe–1 dryland; Thin Hilly range site, 15- to 19-inch precipitation zone; windbreak suitability group 4.

Reeder-Regent complex, rolling (REa).—This complex is made up of rolling soils on ridges and hills in the sedimentary uplands. It is about 40 percent Reeder loam, 30 percent Regent silty clay loam, and 30 percent Doney, Rentsac, and Amherst soils and Rock outcrop. Slopes are mostly 8 to 15 percent, but they range to 4 percent. The Reeder and Regent soils are intermixed on smooth ridges and knolls above sandstone ledges.

Runoff is medium, and the hazard of erosion is moderate. These soils are suited to wildlife, recreation, watershed, range, hay, and limited dryfarmed crops. Because of the Rock outcrop, fields are irregularly shaped. Capability unit IVe–2 dryland; Silty range site, 15- to 19-inch precipitation zone; windbreak suitability group 2M.

Reeder-Rentsac complex, undulating (REb).—This complex is made up of undulating soils on ridges and hills in the sedimentary uplands. It is about 35 percent Reeder loam, 25 percent Rentsac loam, 25 percent Doney loam, and 15 percent Regent, Amherst, and Wayden soils. Slopes are 4 to 8 percent. The Reeder soil is on the smooth sides of shallow drainageways and in troughs between low ridges. The Rentsac and Doney soils are on crests of ridges and along sharp narrow breaks. Included in mapping are areas of soils that have surface channers and low ledges of Rock outcrop.

Runoff is medium, and the hazard of erosion is moderate. These soils are suited to range, wildlife, recreation, and watershed. Capability unit VIs–1 dryland; Silty range site, 15- to 19-inch precipitation zone; windbreak suitability group 3M.

Reeder-Darret association, undulating (REc).—This association is made up of undulating soils on ridges and hills in the sedimentary uplands. It is about equal parts of Reeder loam and Darret silty clay loam and some small spots of Castner stony loam. Slopes are 4 to 8 percent. The soils are intermixed. The Darret soil in this complex has the profile described as representative of the Darret series. In places the Reeder and Darret soils are 5 to 15 percent chert, flint, and silica fragments of gravel size.

Runoff is medium, and the hazard of erosion is moderate. These soils are suited to wildlife, recreation, watershed, range, and hay. Capability unit IIIe–2 dryland; Silty range site, 15- to 19-inch precipitation zone; windbreak suitability group 2M.

Reeder-Darret association, rolling (REd).—This association is made up of rolling soils on ridges and hills in the sedimentary uplands. It is about 45 percent each Reeder loam and Darret silty clay loam and 10 percent Castner stony loam. Slopes are 8 to 15 percent. The Reeder and Darret soils are intermixed. In places they are 5 to 15 percent chert, flint, and silica fragments of gravel size.

Runoff is medium, and the hazard of erosion is moderate. These soils are suited to wildlife, recreation, watershed, range, and pasture. Capability unit IVe-2 dryland; Silty range site, 15- to 19-inch precipitation zone; windbreak suitability group 2M.

Regent Series

The Regent series consists of moderately deep, undulating to hilly and steep, well-drained soils on hills and ridges in the sedimentary uplands. Slopes range from 2 to 35 percent. These soils formed in place in material weathered from clay shale. Elevation ranges from 3,400 to 5,000 feet.

The native vegetation is mainly western wheatgrass, Idaho fescue, timber danthonia, rubber rabbitbrush, and slender wheatgrass. Annual precipitation is 14 to 16 inches, the average annual soil temperature is 44° to 47° F, and the frost-free period is 90 to 110 days.

In a representative profile the surface layer is grayish-brown silty clay loam about 3 inches thick. The subsoil is grayish-brown and pale-olive silty clay loam about 13 inches thick. The substratum is light-gray silty clay loam. Platy shale is at a depth of about 26 inches.

Permeability is slow, and available water capacity is low or moderate. The effective rooting depth is about 26 inches. These soils are used for dryfarmed crops, wildlife, recreation, watershed, and range.

Representative profile of Regent silty clay loam, undulating, in grassland, 1,320 feet west and 1,320 feet north of the SE. corner sec. 2, T. 7 S., R. 39 E.

A1—0 to 3 inches, grayish-brown (2.5Y 5/2) silty clay loam, very dark grayish brown (2.5Y 3/2) moist; strong, fine, platy structure parting to strong, fine, granular; hard, friable, slightly sticky and plastic; clear, smooth boundary.

B2t—3 to 11 inches, grayish-brown (2.5Y 5/2) heavy silty clay loam, very dark grayish brown (2.5Y 3/2) moist; weak, medium, prismatic structure parting to moderate, fine, blocky; hard, friable, sticky and very plastic; thin, patchy clay films on peds; clear boundary.

B3—11 to 16 inches, pale-olive (5Y 6/3) silty clay loam, olive (5Y 5/3) moist; weak, fine, blocky structure; very hard, firm, sticky and plastic; moderately thick, patchy clay films on peds; strongly effervescent; clear boundary.

C1ca—16 to 26 inches, light-gray (5Y 7/2) silty clay loam, olive (5Y 5/3) moist; massive; very hard, firm, sticky and plastic; strongly effervescent; clear, wavy boundary.

C2—26 to 33 inches, pale-yellow (5Y 7/3) fine platy shale, pale olive (5Y 6/3) moist.

Depth to calcareous material ranges from 6 to 17 inches, and depth to shale, from 20 to 40 inches. The A horizon is light brownish gray, grayish brown, and dark grayish brown in hue of 2.5Y or 10YR. It is silty clay loam, clay loam, or silty clay. The B2t horizon is 35 to 45 percent clay. It is grayish brown, light olive brown, and pale olive. The B3ca and Cca horizons are light yellowish brown, pale olive, and light gray.

Regent silty clay loam, gently undulating (Rfa).—This gently undulating soil is on broad ridges in the shale uplands. Slopes are 2 to 4 percent. They range from 150 to 300 feet long. Areas range from 10 to 40 acres in size. The soil has a profile similar to the one described as representative of the series, but it is less sloping.

Runoff is slow, and the hazard of erosion is slight. This soil is suited to dryfarmed crops, hay, wildlife, recreation, watershed, and range. Capability unit IIe–2 dryland; Clayey range site, 15- to 19-inch precipitation zone; windbreak suitability group 2M.

Regent silty clay loam, undulating (Rfc).—This undulating soil is in 20- to 80-acre areas on hills and ridges and in shallow drainageways in the shale uplands. Slopes are 4 to 8 percent. The soil has the profile described as representative of the series. Included in mapping are areas of Wayden silty clay loam.

Runoff is medium, and the hazard of erosion is moderate. This soil is suited to dryframed crops, hay, wildlife, recreation, watershed, and range. Capability unit IIIe–2 dryland; Clayey range site, 15- to 19-inch precipitation zone; windbreak suitability group 2M.

Regent silty clay loam, rolling (Rfd).—This rolling soil is on hills and ridges in the shale uplands. Slopes are 8 to 15 percent. Areas range from 30 to 200 acres in size. The soil has a profile similar to the one described as representative of the series, but it is steeper.

Included with this soil in mapping are areas of Wayden silty clay loam that make up as much as 30 percent of the total area of this mapping unit. Also included are areas of Cherry and Savage soils.

Runoff is rapid, and the hazard of erosion is severe. This soil is suited to recreation, wildlife, watershed, hay, pasture, and limited dryfarmed crops. Capability unit IVe–2 dryland; Clayey range site, 15- to 19-inch precipitation zone; windbreak suitability group 2M.

Renohill Series

The Renohill series consists of moderately deep, undulating, well-drained soils on ridges and hills in the sedimentary uplands. Slopes range from 4 to 8 percent. These soils formed in place in material weathered from calcareous clay loam and silty clay loam shale. Elevation ranges from 3,100 to 4,000 feet.

The native vegetation is mainly western wheatgrass, broom snakeweed, cheatgrass brome, green needlegrass, rubber rabbitbrush, and big sagebrush. Annual precipitation is 13 to 14 inches, the average annual soil temperature is 47° to 49° F, and the frost-free period is 105 to 115 days.

In a representative profile the surface layer is light brownish-gray silty clay loam about 2 inches thick. The subsoil is grayish-brown, brown, and light olive-brown silty clay loam and silty clay about 11 inches thick. The substratum is light brownish-gray and

pale-olive silty clay loam, silty clay, and clay that contains a few shale chips in the lower part. Clay shale is at a depth of about 33 inches.

Permeability is slow, and available water capacity is low. The effective rooting depth is about 33 inches. These soils are used for range, wildlife, recreation, watershed, and dryfarmed crops.

Representative profile of Renohill silty clay loam, undulating, in grassland, 1,000 feet north and 200 feet east of the center of sec. 21, T. 4 S., R. 29 E.

A1—0 to 2 inches, light brownish-gray (10YR 6/2) light silty clay loam, very dark grayish brown (10YR 3/2) moist; moderate, thin, platy structure; slightly hard, friable, slightly sticky and plastic; clear, smooth boundary.

B1—2 to 4 inches, grayish-brown (10YR 5/2) light silty clay loam, dark brown (10YR 3/3) moist; moderate, medium, platy structure; hard, friable, sticky and plastic; clear, smooth boundary.

B2t—4 to 10 inches, brown (10YR 5/3) silty clay, dark brown (10YR 4/3) moist; moderate, medium, prismatic structure parting to moderate, medium, blocky; very hard, firm, very sticky and very plastic; patchy, moderately thick clay films on peds; clear, wavy boundary.

B3—10 to 13 inches, light olive-brown (2.5Y 5/4) heavy silty clay loam, olive brown (2.5Y 4/4) moist; moderate, medium, prismatic structure parting to moderate, medium, blocky; very hard, firm, very sticky and very plastic; slightly effervescent; few medium masses of lime; clear, wavy boundary.

C1ca—13 to 21 inches, light brownish-gray (2.5Y 6/2) heavy silty clay loam, olive brown (2.5Y 4/4) moist; weak, medium, prismatic structure parting to weak, medium, blocky; very hard, firm, sticky and plastic; strongly effervescent; common medium and coarse lime masses; gradual, wavy boundary.

C2ca—21 to 26 inches, light brownish-gray (2.5Y 6/2) silty clay, dark grayish brown (2.5Y 4/2) moist; moderate, medium, subangular blocky structure; very hard, very firm, very sticky and plastic; strongly effervescent; common coarse lime masses; gradual, wavy boundary.

C3ca—26 to 33 inches, pale-olive (5Y 6/3) clay, olive (5Y 4/3) moist; massive; very hard, very firm, very sticky and very plastic; common weathered shale chips; strongly effervescent; common very coarse lime masses; gradual, wavy boundary.

C4—33 to 41 inches, thin, platy clay shale.

Depth to calcareous material ranges from 9 to 15 inches, and depth to bedrock, from 20 to 40 inches. The A1 and B2t horizons are light brownish gray, grayish brown, brown, and light olive brown in hue of 2.5Y and 10YR. The Cca horizon is light brownish gray, pale olive, and light yellowish brown in hue of 2.5Y and 5Y.

Renohill silty clay loam, undulating (Re).—This soil is on broad ridgetops and tablelands that are crossed by shallow drainageways. Slopes are 4 to 8 percent. Areas range from 20 to 50 acres in size.

Included with this soil in mapping are areas of Midway silty clay loam on narrow ridges and Thurlow silty clay loam and Heldt silty clay loam in the concave heads of drainageways. Also included are soils that have a few fragments of pebble size on the surface in areas where terraces once covered the shale upland.

Runoff is medium, and the hazard of erosion is moderate. This soil is suited to dryfarmed crops, hay, wildlife, recreation, watershed, and range. Capability unit IIIe-3 dryland; Clayey range site, 10- to 14-inch precipitation zone; windbreak suitability group 2M.

Rentsac Series

The Rentsac series consists of shallow, undulating and rolling, well-drained soils on ridges and hills in the sedimentary uplands. Slopes range from 4 to 15 percent. These soils formed in place in material weathered from calcareous, hard, fine-grained shale and sandstone. Elevation ranges from 3,700 to 4,800 feet.

The native vegetation is mainly side-oats grama, prairie junegrass, bluebunch wheatgrass, dryland sedges, broom snakeweed, and wild rose. Annual precipitation is 10 to 15 inches, the average annual soil temperature is 46° to 47° F, and the frost-free period is 105 to 110 days.

In a representative profile the surface layer is light brownish-gray and grayish-brown loam about 4 inches thick. The underlying material is light brownish-gray channery loam. Hard sandy shale is at a depth of about 8 inches.

Permeability is moderately rapid, and available water capacity is very low. The effective rooting depth is 10 inches. Most of these soils are used for range, wildlife, recreation, and watershed, but small areas included with deeper soils are used for dryfarmed crops.

Representative profile of Rentsac loam, in an area of Rentsac-Doney complex, rolling, in grassland, 990 feet north and 350 feet east of the SE. corner sec. 35, T. 7 S., R. 39 E.

A11—0 to 1 inch, light brownish-gray (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; weak, coarse, granular structure; soft, very friable, nonsticky and nonplastic; few small sandstone chips; slightly effervescent; clear boundary.

A12—1 inch to 4 inches, grayish-brown (10YR 5/2) loam, dark brown (10YR 3/3) moist; weak, medium, prismatic structure; slightly hard, friable, nonsticky and slightly plastic; about 5 percent (volume) flat, hard sandstone chips; strongly effervescent; gradual boundary.

C—4 to 8 inches, light brownish-gray (10YR 6/2) channery loam, dark brown (10YR 3/3) moist; weak, medium, subangular blocky structure; slightly hard, friable, nonsticky and slightly plastic; 40 percent (volume) thin, hard sandstone fragments, 1/16 to 1/4 inch in diameter; strongly effervescent; abrupt, wavy boundary.

R—8 to 10 inches, hard sandy shale.

Depth to shale and sandstone bedrock ranges from 4 to 20 inches. The soil is sandy loam or loam that is 15 to 60 percent, but typically 35 to 50 percent, coarse fragments of channer and gravel size. Hue ranges from 2.5Y to 7.5YR throughout. The A1 horizon is brown, light brownish gray, light brown, grayish brown, and pale brown. The C horizon is light brownish gray, light yellowish brown, pale brown, and very pale brown.

Rentsac-Doney complex, rolling (RH).—This complex is made up of rolling soils on hills and narrow ridges in the mixed shale and hard sandstone uplands. It is about 45 percent Rentsac loam and Rentsac channery loam, 30 percent Doney loam, and 25 percent Wayden silty clay loam, Dast sandy loam, and Rock outcrop. Slopes are 8 to 15 percent. Local relief is 30 to 125 feet. The soils are intermixed. Rock outcrop occurs as low ledges along drainageways and is scattered in areas of the Rentsac soil. The Rentsac loam in this

complex has the profile described as representative of the Rentsac series.

Runoff is rapid, and the hazard of erosion is severe. These soils are suited to range, wildlife, recreation, and watershed. Capability unit VIe–1 dryland; Shallow range site, 15- to 19-inch precipitation zone; windbreak suitability group 3M.

Richfield Series

The Richfield series consists of deep, nearly level to undulating, well-drained soils on high benches and hills and ridges. Slopes range from 0 to 8 percent. These soils formed in silt loam and silty clay loam alluvium transported by water and wind. Elevation ranges from 3,100 to 3,600 feet.

The native vegetation is mainly western wheatgrass, prairie junegrass, big sage, plains reedgrass, and winterfat. Annual precipitation is 14 to 15 inches, the average annual soil temperature is 47° to 49° F, and the frost-free period is 110 to 120 days.

In a representative profile the surface layer is grayish-brown silty clay loam about 9 inches thick. The subsoil is brown and light yellowish-brown silty clay loam about 10 inches thick. The substratum is light brownish-gray and light olive-gray silt loam and loam that extends to a depth of 65 inches or more.

Permeability is moderately slow, and available water capacity is high. The effective rooting depth is 60 inches or more. These soils are used for dryfarmed crops, watershed, recreation, wildlife, and range. They are suitable for irrigation.

Representative profile of Richfield silty clay loam, 0 to 2 percent slopes, in a cultivated area, 660 feet north and 300 feet east of the SW. corner sec. 10, T. 2 S., R. 34 E.

Ap1—0 to 7 inches, grayish-brown (10YR 5/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; weak, very fine, granular structure; hard, friable, sticky and slightly plastic; few fine roots; clear, smooth boundary.

Ap2—7 to 9 inches, grayish-brown (10YR 5/2) heavy silty clay loam, dark brown (10YR 3/2) moist; weak, coarse, blocky structure; hard, friable, slightly sticky and plastic; few very fine roots; abrupt, smooth boundary.

B2t—9 to 13 inches, brown (10YR 5/3) silty clay loam, dark brown (10YR 4/3) moist; moderate, medium, prismatic structure parting to moderate, medium, blocky; hard, friable, sticky and plastic; few very fine roots; common very fine pores; thin, patchy clay films on peds; clear, wavy boundary.

B3—13 to 19 inches, light yellowish-brown (2.5Y 6/4) silty clay loam, olive brown (2.5Y 4/4) moist; weak, medium, prismatic structure parting to weak, medium, blocky; hard, friable, sticky and plastic; few very fine roots; many very fine pores; slightly effervescent; few fine, soft lime masses; gradual, wavy boundary.

C1ca—19 to 26 inches, light brownish-gray (2.5Y 6/2) heavy silt loam, grayish brown (2.5Y 5/2) moist; weak, coarse, prismatic structure parting to weak, coarse, blocky; hard, friable, sticky and slightly plastic; few very fine roots; common very fine pores; strongly effervescent; common fine lime threads and soft lime masses; diffuse, wavy boundary.

C2ca—26 to 37 inches, light brownish-gray (2.5Y 6/2) silt loam, grayish brown (2.5Y 5/2) moist; weak, coarse, prismatic structure; hard, friable, sticky and slightly plastic; common very fine pores; strongly effervescent; common fine, soft lime masses; diffuse, wavy boundary.

C3—37 to 65 inches, light olive-gray (5Y 6/2) loam, olive (5Y 4/4) moist; massive; hard, friable, slightly sticky and slightly plastic; few very fine pores; strongly effervescent; few fine, soft lime masses.

The A and B horizons range from 9 to 18 inches in thickness. Depth to carbonates ranges from 10 to 16 inches. The A1 horizon is grayish-brown and brown silt loam or light silty clay loam. It ranges from 2 to 4 inches in thickness. The B2t horizon is 35 to 45 percent clay, and it ranges from 7 to 14 inches in thickness. It is brown and grayish brown. The Cca horizon is light brownish gray, light gray, and light yellowish brown.

Richfield silty clay loam, 0 to 2 percent slopes (Rk).—This nearly level soil is on benches and shale uplands that are mantled with silt loam and silty clay loam alluvium. It has the profile described as representative of the series. Included in mapping are small areas of Hydro silt loam and Allentine silty clay.

Runoff is slow, and the hazard of erosion is slight. This soil is suited to irrigated and dryfarmed crops, hay, wildlife, recreation, watershed, and range. Capability unit IIIc–1 dryland, IIc–2 irrigated; Silty range site, 10- to 14-inch precipitation zone; windbreak suitability group 1.

Richfield silty clay loam, gently undulating (RIc).—This soil is in 15- to 100-acre areas on benches and shale uplands that are mantled with silt loam and silty clay loam alluvium. Slopes are 2 to 4 percent and are 100 to 300 feet long. Drainageways are shallow, and total relief is only 10 to 30 feet. The soil has a profile similar to the one described as representative of the series, but it is steeper. Included in mapping are areas of Hydro silt loam.

Runoff is medium, and the hazard of erosion is moderate. This soil is suited to irrigated and dryfarmed crops, hay, wildlife, recreation, watershed, and range. Capability unit IIIe–3 dryland, IIe–1 irrigated; Silty range site, 10- to 14-inch precipitation zone; windbreak suitability group 1.

Richfield silty clay loam, undulating (RId).—This soil is on benches and shale uplands that are mantled with silt loam and silty clay loam alluvium. Slopes are 4 to 8 percent. Drainageways are 8 to 25 feet deep. The soil has a profile similar to the one described as representative of the series, but it is steeper.

Runoff is medium, and the hazard of erosion is moderate. This soil is suited to irrigated and dryfarmed crops, hay, wildlife, recreation, watershed, and range. Capability unit IIIe–3 dryland, IIIe–1 irrigated; Silty range site, 10- to 14-inch precipitation zone; windbreak suitability group 1.

Richfield-Beauvais silty clay loams, gently undulating (RIe).—This complex is made up of gently undulating soils on high terraces and shale uplands that are mantled with silt loam and silty clay loam alluvium. It is about 60 percent Richfield silty clay loam, 30 percent Beauvais silty clay loam, and 10 percent Hydro loam. The soils are on low knolls separated by swales. The Richfield silty clay loam is in the swales and the concave surfaces. It has slopes of 2 percent. The Beauvais soil is on the knolls and crests of undulations. It has slopes of 3 to 4 percent. The Hydro soil is in level areas.

Runoff is slow, and the hazard of erosion is slight. These soils are suited to irrigated and dryfarmed crops, hay, wildlife, recreation, watershed, and range. Capability unit IIIe–3 dryland, IIe–1 irrigated; Clayey range site, 10- to 14-inch precipitation zone; windbreak suitability group 1.

Richfield-Beauvais silty clay loams, undulating (RIf).—This complex is made up of undulating soils on terraces and shale uplands that are mantled with silt loam and silty clay loam alluvium. It is about 55 percent Richfield silty clay loam, 35 percent Beauvais silty clay loam, and 10 percent Colby silt loam. Slopes are 4 to 8 percent. Main drainageways at terrace edges or between the mantled ridges make local relief of 15 to 30 feet. The Richfield soil has smooth slopes of 4 to 5 percent and is between knolls and ridges of the Beauvais soil. The Colby soil has slopes of 7 to 8 percent and is along the short terrace slope breaks and on narrow ridgetops. The Richfield and Beauvais soils in this complex have profiles similar to the ones described as representative of their respective series, but they are steeper.

Runoff is medium, and the hazard of erosion is moderate. These soils are used for irrigated and dryfarmed crops, hay, wildlife, recreation, watershed, and range. Capability unit IIIe–3 dryland, IIIe–1 irrigated; Clayey range site, 10- to 14-inch precipitation zone; windbreak suitability group 1.

Ringling Series

The Ringling series consists of shallow, rolling to very steep, well-drained soils in the sedimentary uplands. Slopes range from 8 to 95 percent. These soils formed in place in material weathered from hard, red, baked shale or porcelanite rock. Elevation ranges from 3,400 to 5,000 feet.

The native vegetation is mainly bluebunch wheatgrass, Idaho fescue, Sandberg bluegrass, and ponderosa pine. Annual precipitation is 14 to 16 inches, the average annual soil temperature is 45° to 47° F, and the frost-free period is 90 to 105 days.

In a representative profile the surface layer is reddish-brown channery loam about 3 inches thick. The underlying material is reddish-brown very channery loam that is 35 to 80 percent coarse fragments. Hard, platy shale is at a depth of about 13 inches.

Permeability is rapid, and available water capacity is very low. The effective rooting depth is about 15 inches. These soils are used only for range.

Representative profile of Ringling channery loam, in an area of Doney-Ringling complex, rolling, in grassland, 2,000 feet west and 2,300 feet north of the SW. corner sec. 17, T. 5 S., R. 38 E.

A1—0 to 3 inches, reddish-brown (5YR 4/4) channery loam, dark reddish brown (5YR 3/3) moist; weak, fine, granular structure; soft, very friable, nonsticky and nonplastic; many very fine roots; many very fine interstitial pores; 30 percent thin, hard shale fragments; clear, wavy boundary.

C1—3 to 13 inches, reddish-brown (5YR 5/3) very channery loam, dark reddish brown (5YR 3/4) moist; massive; soft, very friable, nonsticky and nonplastic; many very fine roots; 35 percent, increasing to 80 percent, hard shale fragments; abrupt, irregular boundary.

C2—13 to 60 inches, hard, platy, red, baked shale coated with lime; coatings of lime along bedding planes.

Depth to fractured bedrock ranges from 5 to 20 inches. The soil ranges from 45 to 60 percent coarse fragments. Lime coatings are on rock fragments in places, but the loam-textured earth is noncalcareous. The A1 horizon is reddish brown and brown in hue of 7.5YR to 2.5YR.

Ringling soils in the Big Horn County Area are mapped only with Searing and Doney soils.

Riverwash

Riverwash (RM) is along river channels. It includes gravel bars, low islands, and eroded flood plains that are nearly barren. Annual weeds and a few willows grow in the stable areas. Frequent flooding produces yearly changes in size and shape of areas of this land type. The alluvial material of these areas is mainly sand, loamy sand, gravelly sand, and sandy gravel. A thin layer of loam covers small spots in slack water areas.

Riverwash is suitable for wildlife. Capability unit VIIIs–1 dryland; not placed in a range site or windbreak suitability group.

Rock Outcrop

Rock outcrop is mapped only in complex with other mapping units. It consists of exposures of such bare, hard bedrock as limestone, sandstone, shale, and granite. It is on ledges and isolated pinnacles. Ledges that form canyon rims act as barriers to the movement of game animals and livestock.

Rock outcrop is used mainly for recreation, watershed, and wildlife. Capability unit VIIIs–1 dryland; not placed in a range site or windbreak suitability group.

Rock outcrop-Duncom complex, very steep (RN).—This complex is on the rims and sides and in the narrow bottoms of deep canyons and valleys in the sedimentary highlands. It is 50 to 70 percent Rock outcrop, 15 to 25 percent Duncom channery loam, and 5 to 15 percent Babb channery loam and Hanson channery loam. Slopes are 35 to 100 percent. Areas range from 100 to 800 acres in size. Relief is 200 to 900 feet. Rock outcrop occurs as ledges and pinnacles. The Duncom soil is along canyon rims and spur ridges that project from the canyon sides. It has slopes of 35 to 75 percent. The Babb and Hanson soils are on the colluvial slopes below Rock outcrop and in narrow valleys. They have a cover of juniper, Douglas-fir, ponderosa pine, limber pine, ninebark, and skunkbush sumac.

Runoff is rapid, and the hazard of erosion is moderate. These soils are used from range, wildlife, watershed, and recreation. The canyon rims act as barriers to game travel. Capability unit VIIe–1 dryland; Shallow range site, 20- to 24-inch precipitation zone; windbreak suitability group 4.

Rock outcrop-Lap complex, very steep (RO).—This complex is on the rims and sides and in the bottoms of deep canyons and valleys in the sedimentary highlands. It is 45 to 60 percent Rock outcrop and 40 to 55 percent Lap channery loam. Slopes are 15 to 75 percent. Rock outcrop occurs mainly as ledges on canyon rims and on the canyon sides. The Lap soil

is on narrow ridges, above the rock ledges, and on the lower sides of the canyons. It has slopes of 15 to 25 percent. Rock outcrop has slopes of 25 to 75 percent. Included in mapping are areas where the underlying material of the Lap soil is light reddish brown and red.

Runoff is rapid, and the hazard of erosion is moderate. These soils are suited to range, wildlife, watershed, and recreation. The canyon rims act as barriers to game travel. Capability unit VIIe–1 dryland; Shallow range site, 15- to 19-inch precipitation zone; windbreak suitability group 4.

Rock outcrop-Pultney complex, very steep (RP).—This complex is on steep valley sides and escarpments along mountain fronts. It is 50 to 65 percent Rock outcrop and 35 to 50 percent Pultney channery loam. Limestone, shale, and sandstone outcrops of varying color are on the rims and upper sides of the valleys and on ledges on the mountain front. Slopes are 35 to 95 percent. The Pultney soil is above and between the rock ledges and has slopes of 35 to 50 percent. The Pultney soil in this complex has a profile similar to the one described as representative of the series, but 5 to 15 percent of the surface is covered with limestone, shale, chert, and sandstone fragments of channer and gravel size.

Runoff is rapid, and the hazard of erosion is severe. These soils are suited to range, watershed, wildlife, and recreation. Capability unit VIIe–1 dryland; Shallow range site, 10- to 14-inch precipitation zone; windbreak suitability group 4.

Rock outcrop-Rentsac complex, rolling (RR).—This complex is on sloping bedrock uplands and foothills. It is about 40 percent Rock outcrop, 40 percent Rentsac loam, and 20 percent Dast sandy loam and Absarokee clay loam. Outcrops of sandstone and conglomerate make a local relief of 1 foot to 5 feet. Slopes are 5 to 15 percent. Where drainageways have eroded through the bedrock, a rock ledge, 2 to 5 feet thick, forms the edge of the drainageways. The Rentsac soil is in 1/10- to 1/4-acre patches mixed with Rock outcrop. The Dast soil is along low sandstone ledges on higher knolls and ridges. The Absarokee soil is at the heads of drainageways. In some places fine pebble-sized fragments weathered from the conglomerate rocks are scattered through the soils. The soils in this complex have a reddish-brown and light reddish-brown subsoil and substratum.

Runoff is medium, and the hazard of erosion is moderate. These soils are suited to range, wildlife, watershed, and recreation. Capability unit VIe–1 dryland; Shallow range site, 15- to 19-inch precipitation zone; windbreak suitability group 4.

Rock outcrop-Windham complex, very steep (RS).—This complex is on very steep canyons and along mountain fronts. It is 60 to 70 percent Rock outcrop and 30 to 40 percent Windham stony loam. Slopes are 50 to 100 percent. In the canyons Rock outcrop is on the rims and upper sides, and the Windham soil is in the colluvium below Rock outcrop. On the mountain fronts Rock outcrop occurs as low ledges in the Windham soils and as the upper part of the mountain. Included in mapping are areas of Lap channery loam on mountain fronts.

Runoff is rapid, and the hazard of erosion is slight. These soils are suited to game range, watershed, and recreation. The canyon rims act as barriers to game travel. Capability unit VIIe–1 dryland; Thin Breaks range site, 15- to 19-inch precipitation zone; windbreak suitability group 4.

Rottulee Series

The Rottulee series consists of moderately deep, undulating to rolling, well-drained soils in the sedimentary uplands. Slopes range from 2 to 15 percent. These soils formed in place in material weathered from mixed shale and limestone. Elevation ranges from 4,500 to 5,500 feet.

The native vegetation is mainly green needlegrass, bluebunch wheatgrass, Hoods phlox, prairie junegrass, and gayfeather. Annual precipitation is 17 to 18 inches, the average annual soil temperature is 45° to 47° F, and the frost-free period is 90 to 105 days.

In a representative profile the surface layer is dark-brown silt loam about 2 inches thick. The subsoil is reddish-brown and light reddish-brown silt loam about 13 inches thick. The substratum is light reddish-brown gravelly light clay loam. Shattered limestone is at a depth of about 22 inches.

Permeability is moderate, and available water capacity is low. The effective rooting depth is about 24 inches. These soils are used for range, wildlife, recreation, and watershed.

Representative profile of Rottulee silt loam, undulating, in grassland, 660 feet north and 200 feet east of the SW. corner sec. 18, T. 8 S., R. 33 E.

A1—0 to 2 inches, dark-brown (7.5YR 4/2) silt loam, dark brown (7.5YR 3/2) moist; weak, thin, platy structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine roots; many very fine tubular pores; slightly effervescent; clear, smooth boundary.

B1—2 to 6 inches, reddish-brown (5YR 5/3) silt loam, dark reddish brown (5YR 3/3) moist; weak, medium, prismatic structure; slightly hard, very friable, slightly sticky and plastic; common very fine roots; common very fine tubular pores; slightly effervescent; clear wavy boundary.

B2—6 to 10 inches, light reddish-brown (5YR 6/3) heavy silt loam, reddish brown (5YR 4/4) moist; moderate, medium, prismatic structure; hard, friable, sticky and plastic; common very fine roots; common fine and very fine tubular pores; slightly effervescent; clear, wavy boundary.

B3—10 to 15 inches, light reddish-brown (5YR 6/3) heavy silt loam, reddish brown (5YR 4/4) moist; moderate, medium and fine, blocky structure; hard, friable, sticky and plastic; common very fine roots; common very fine tubular pores; strongly effervescent; few threads of segregated lime; clear, wavy boundary.

Cca—15 to 22 inches, light reddish-brown (5YR 6/4) gravelly light clay loam, yellowish red (5YR 5/6) moist; weak, fine, blocky structure; hard, friable, slightly sticky and slightly plastic; common very fine roots; common very fine tubular pores; 20 percent (volume) shale fragments; strongly effervescent; common fine, segregated lime threads; gradual boundary.

R—22 inches, shattered limestone.

Depth to bedrock ranges from 20 to 30 inches. The soil between depth of 10 inches and the bedrock is silt loam, loam, or light clay loam. Shale and limestone fragments of gravel size increase with increasing depth to as much as

30 percent just above the bedrock. Hue ranges from 7.5YR to 10R throughout.

Rottulee silt loam, gently undulating (Rt).—This soil is on smooth parts of sloping bedrock uplands along mountain fronts. Slopes are 2 to 4 percent. The soil has a profile similar to the one described as representative of the series, but it is less sloping. Included in mapping are areas of Peritsa silt loam in broad swales and shallow troughs between ridges.

Runoff is slow, and the hazard of erosion is slight. This soil is used for range, hay, wildlife, recreation, watershed, and dryfarmed crops. Capability unit IIe–2 dryland; Silty range site, 15- to 19-inch precipitation zone; windbreak suitability group 3L.

Rottulee silt loam, undulating (Ru).—This soil is on broad ridges between deep, narrow valleys. Slopes are 4 to 8 percent. The soil has the profile described as representative of the series.

Included with this soil in mapping are areas where platy red shale is at a depth of 20 to 40 inches and spots of soils that have a surface layer of channery and cobbly loam.

Runoff is medium, and the hazard of erosion is moderate. This soil is used for wildlife, range, hay, and dryfarmed crops. Capability unit IIIe–2 dryland; Silty range site, 15- to 19-inch precipitation zone; windbreak suitability group 3L.

Rottulee silt loam, rolling (Rv).—This soil is on tilted bedrock uplands along mountain fronts and in drainageways that cut through limestone and red shale hills. Slopes are 8 to 15 percent. The soil has a profile similar to the one described as representative of the series, but it is steeper. Included in mapping are areas of Abac channery loam and Peritsa silt loam.

Runoff is rapid, and the hazard of erosion is severe. This soil is used for wildlife, recreation, watershed, range, hay and pasture. Capability unit IVe–2 dryland; Silty range site, 15- to 19-inch precipitation zone; windbreak suitability group 3L.

Rottulee-Abac complex, rolling (RW).—This complex is made up of rolling soils on wide ridges between deep, narrow drainageways in limestone and red shale highlands. It is about 65 percent Rottulee silt loam, 25 percent Abac cobbly loam, and 10 percent Rock outcrop. Slopes are 8 to 15 percent. The soils are intermixed, but surface fragments of cobble size and Rock outcrop mark the areas of Abac soils. The Rottulee and Abac soils in this complex have profiles similar to the ones described as representative of their respective series, but they are steeper, and the Abac soil has limestone fragments of cobble size on the surface.

Runoff is rapid, and the hazard of erosion is severe. These soils are used for range, wildlife, recreation, and watershed. Capability unit VIe–1 dryland; Silty range site, 15- to 19-inch precipitation zone; windbreak suitability group 3L.

Ryorp Series

The Ryorp series consists of moderately deep, undulating and rolling, well-drained soils on ridges and valley sides in the mountainous uplands. Slopes are mostly 4 to 8 percent, but they range to 15 percent. These soils formed in place in material weathered from noncalcareous sandstone. Elevation ranges from 6,000 to 7,500 feet.

The native vegetation is mainly lodgepole pine and an understory of huckleberry, oregongrape, and bedstraw. Annual precipitation is 18 to 20 inches, the average annual soil temperature is 40° to 42° F, and the frost-free period is 60 to 75 days.

In a representative profile a thin mat of pine needles overlies the surface layer of light brownish-gray fine sandy loam about 2 inches thick. The subsoil is pale-brown fine sandy loam about 19 inches thick. The substratum is pale-brown sandy loam. Sandstone is at a depth of about 34 inches.

Permeability is rapid, and available water capacity is low. The effective rooting depth is about 30 inches. These soils are used for woodland, watershed, recreation, and game range.

Representative profile of Ryorp sandy loam, undulating, in woodland, 1,320 feet south and 300 feet east of the NW. corner of sec. 29, T. 6 S., R. 26 E.

O—2 inches to 0, loose mat of partly decomposed pine needles and twigs.

A2—0 to 2 inches, light brownish-gray (10YR 6/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; weak, thin, platy structure; soft very friable, nonsticky and nonplastic; many coarse and medium and common fine and very fine roots; clear, smooth boundary.

B2—2 to 21 inches, pale-brown (10YR 6/3) fine sandy loam, dark brown (10YR 4/3) moist; few coarse, brown (10YR 5/4) iron mottles that have a diffuse boundary; moderate, coarse, prismatic structure; slightly hard, very friable, nonsticky and nonplastic; common coarse, medium, fine, and very fine pores; gradual wavy boundary.

C—21 to 34 inches, pale-brown (10YR 6/3) sandy loam, brown (10YR 5/3) moist; massive; hard, very friable, nonsticky and nonplastic; few fine roots; few fine tubular pores; abrupt boundary.

R—34 inches, noncalcareous sandstone.

Depth to bedrock ranges from 20 to 40 inches. Hue ranges from 2.5Y to 7.5YR throughout. Sandstone fragments range from 0 to 30 percent above the bedrock. The B2 horizon ranges from brown to light yellowish brown. The B2 horizon and the upper part of the C horizon are 12 to 18 percent clay.

Ryorp sandy loam, undulating (Ry).—This soil is on broad ridges and the upper sides of mountain valleys. Areas are as much as 800 acres in size. Slopes are mostly 4 to 8 percent, but they range to 15 percent. Slopes range from 300 to 600 feet long. Included in mapping are areas of soils that have a surface layer of loam and loamy fine sand.

Runoff is medium, and the hazard of erosion is moderate. This soil is used for woodland, recreation, watershed, and game range. The principal tree species are lodgepole pine and limber pine. The average site index for the lodgepole pine is 65.

Timber harvest on this soil is not limited by terrain or soil characteristics. Access is along the broad ridges and hilltops. Areas in the Pryor Mountains are logged. Area burning of slash helps to assure regrowth. Capability unit IVe–2; not placed in a range site or windbreak suitability group.

Saline Land

Saline land (SA) is in river and perennial stream val-

leys on seeped and saline-affected areas on flood plains, terraces, and fans. Most areas have a water table at a depth of 3 to 6 feet. Some areas below irrigation canals have a water table at the surface during part of the growing season. The soil material ranges from loam to clay and from 3 feet to more than 6 feet in thickness. Slopes range from 0 to 35 percent, but they are mostly 0 to 4 percent. The salinity effect is estimated to range from moderate to severe. Salt crusts, common early in spring, give the areas a light-gray color. Most areas cannot be reclaimed because they lack drainage outlets.

Runoff is slow, and the hazard of erosion is slight. In the perennial stream valleys, channel erosion is active during spring runoff.

Saline land is suited to range and wildlife. Capability unit VIw–1 dryland; Saline Lowland range site, 10- to 14-inch precipitation zone; windbreak suitability group 3S.

Savage Series

The Savage series consists of deep, nearly level to strongly sloping and rolling, well-drained soils on fans, terraces, and foot slopes. Slopes are mostly 0 to 15 percent, but they range to 20 percent. These soils formed in calcareous alluvium or loess derived from mixed sources that have a low proportion of sand. Elevation ranges from 3,600 to 4,200 feet.

The native vegetation is mainly western wheatgrass, green needlegrass, prairie junegrass, and wooly indianwheat. Annual precipitation is 15 to 16 inches, the average annual soil temperature is 45° to 47° F, and the frost-free period is 95 to 115 days.

In a representative profile the surface layer is dark grayish-brown silt loam about 2 inches thick. The subsoil is grayish-brown and dark grayish brown silty clay loam and silty clay about 21 inches thick. The substratum is olive silty clay and pale-olive silty clay loam that extends to a depth of 61 inches or more.

Permeability is moderately slow, and available water capacity is moderate or high. The effective rooting depth is 60 inches or more. These soils are used for dryfarmed and irrigated crops, wildlife, recreation, watershed, and range.

Representative profile of Savage silty clay loam, 2 to 4 percent slopes, in grassland, 1,320 feet north and 50 feet east of the SW. corner sec. 8, T. 9 S., R. 35 E.

A1—0 to 2 inches, dark grayish-brown (2.5Y 4/2) heavy silt loam, very dark brown (2.5Y 2/2) moist; weak, thick, platy structure; hard, friable, slightly sticky and plastic; many fine and few medium roots; clear, smooth boundary.

B21t—2 to 6 inches, grayish-brown (2.5Y 5/2) heavy silty clay loam, very dark grayish brown (2.5Y 3/2) moist; moderate, medium and coarse, prismatic structure parting to moderate, medium, blocky; very hard, firm, very sticky and very plastic; thin, patchy clay films on peds; common very fine roots; common fine pores, clear, wavy boundary.

B22t—6 to 16 inches, dark grayish-brown (2.5Y 4/2) silty clay, very dark grayish brown (2.5Y 3/2) moist; moderate, medium and coarse, prismatic structure parting to strong, medium, blocky; very hard, firm, very sticky and very plastic; continuous clay films on peds; common very fine roots; common fine tubular pores; clear, wavy boundary.

B3ca—16 to 23 inches, grayish-brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; strong, coarse, prismatic structure parting to moderate, medium and coarse, blocky; very hard, very firm, very sticky and very plastic; few very fine and fine roots; few fine pores; strongly effervescent; common fine lime threads and soft, medium lime masses; gradual, wavy boundary.

C1ca—23 to 29 inches, olive (5Y 5/3) silty clay, olive (5Y 4/3) moist; weak, coarse, prismatic structure parting to moderate, medium, blocky; very hard, very firm, very sticky and very plastic; few fine roots; common very fine and fine pores; strongly effervescent; common fine lime threads and medium, soft lime masses; gradual, wavy boundary.

C2—29 to 39 inches, olive (5Y 5/3) light silty clay, olive (5Y 4/3) moist; weak, medium, blocky structure; very hard, very firm, very sticky and very plastic; few fine roots; common fine pores; strongly effervescent; common fine lime threads and medium, soft lime masses; diffuse, irregular boundary.

C3—39 to 61 inches, pale-olive (5Y 6/3) silty clay loam, olive (5Y 4/3) moist; massive; hard, firm, sticky and plastic; few fine roots; few fine pores; strongly effervescent; few fine, soft lime masses.

Hue ranges from 2.5Y to 7.5YR throughout. The A1 horizon is dark grayish-brown and grayish-brown silt loam or silty clay loam. The B2t horizon ranges from 35 to 45 percent clay and is grayish brown, dark grayish brown, and light yellowish brown.

Savage silty clay loam, 0 to 2 percent slopes (Sd).—This nearly level soil is on narrow terraces along stream channels. In places the surface is broken by channel scars that are 1 foot to 2 feet deep. The soil has a profile similar to the one described as representative of the series, but it is less sloping.

Runoff is slow, and the hazard of erosion is slight. This soil is used for irrigated and dryfarmed crops, hay, wildlife, and range. Capability unit IIs–2 dryland, IIc–2 irrigated; Clayey range site, 15- to 19-inch precipitation zone; windbreak suitability group 1.

Savage silty clay loam, 2 to 4 percent slopes (Sea).—This gently sloping soil is on terraces and fans. It has the profile described as representative of the series.

Runoff is slow, and the hazard of erosion is slight. This soil is used for irrigated and dryfarmed crops, hay, wildlife, and range. Capability unit IIe–2 dryland, IIe–1 irrigated; Clayey range site, 15- to 19-inch precipitation zone; windbreak suitability group 1.

Savage silty clay loam, 4 to 8 percent slopes (Seb).—This sloping soil is on fans and foot slopes. Areas are less than 30 acres in size and are generally crossed by drainage channels that are 5 to 10 feet deep. Most areas receive runoff from soils above them. Slopes range from 200 to 350 feet long. The soil has a profile similar to the one described as representative of the series, but it is steeper.

Runoff is medium, and the hazard of erosion is moderate. This soil is used for dryfarmed crops, hay, wildlife, and range. Capability unit IIIe–2 dryland; Clayey range site, 15- to 19-inch precipitation zone; windbreak suitability group 1.

Savage silty clay loam, undulating (Sec).—This undulating soil is on loess-mantled hills and dissected terraces. Slopes are 4 to 8 percent. Most areas are crossed by roughly parallel drainageways that are 5 to 25 feet deep. Slopes are 6 to 8 percent on the sides of drainageways and 4 to 5 percent in other areas. The soil has a profile similar to the one described as representative of the series, but it is steeper.

Runoff is medium, and the hazard of erosion is moderate. This soil is used for dryfarmed crops, hay, wildlife, and range. Capability unit IIIe–2 dryland; Clayey range site, 15- to 19-inch precipitation zone; windbreak suitability group 1.

Savage silty clay loam, rolling (Sed).—This rolling soil is on eroded parts of gravel terraces and loess-mantled hills. Slopes are 8 to 15 percent. Areas range from 20 to 100 acres in size. Local relief is 20 to 50 feet. The soil has a profile similar to the one described as representative of the series, but it is steeper.

Included with this soil in mapping are areas of Judith loam, which has surface fragments of gravel size, and areas of Wayden silty clay loam.

Runoff is rapid, and the hazard of erosion is severe. This soil is used for wildlife, range, hay, pasture, and dryfarmed crops. Capability unit IVe–2 dryland; Clayey range site, 15- to 19-inch precipitation zone; windbreak suitability group 1.

Savage-Wayden silty clay loams, 4 to 15 percent slopes (Sef).—This complex is made up of gently sloping and strongly sloping soils. It is 40 to 55 percent Savage silty clay loam, 20 to 35 percent Wayden silty clay loam, and 5 to 20 percent Doney, Regent, Farnuf, and Frazer soils. The Savage soil is on foot slopes, terraces, and fans between the shale knolls and ridges that are occupied by the Wayden soil. The Doney and Regent soils are near the Wayden soil. Slopes are 4 to 8 percent on the valley bottoms and the lower parts of fans and foot slopes. The Wayden soils and nearby soils have slopes of 12 to 15 percent. The Savage soil in this complex has a profile similar to the one described as representative of the Savage series, but it is steeper.

Runoff is medium, and the hazard of erosion is moderate. Most areas receive runoff from the hills that border the valleys. Channel erosion is active in spring and early in summer. These soils are used for wildlife, range, hay, and pasture. Capability unit IVe–2 dryland; Clayey range site, 15- to 19-inch precipitation zone; windbreak suitability group 1.

Savage and Frazer soils, 0 to 4 percent slopes (SF).—This undifferentiated soil group is made up of nearly level and gently sloping Savage silty clay loam and Frazer silty clay. Mapped areas may include only one of these soils, or both may be present. They occur in no predictable pattern. The Savage and Frazer soils in this mapping unit have profiles similar to the ones described as representative of their respective series, but the surface layer is silt loam and silty clay loam and in places the water table is below a depth of 3 feet.

Runoff is slow, and the hazard of erosion is severe. Areas at the mouths of tributary drainageways are overflowed early in spring. These soils are used for range, wildlife, recreation, and watershed. Capability unit VIw–1 dryland; Clayey range site, 15- to 19-inch precipitation zone; windbreak suitability group 4.

Sawcreek Series

The Sawcreek series consists of moderately deep, rolling and hilly, well-drained soils on valley sides, hills, and ridges in the mountainous uplands. Slopes range from 8 to 35 percent. These soils formed in place in material weathered from noncalcareous sandstone. Elevation ranges from 5,500 to 6,500 feet.

The native vegetation is mainly limber pine, Douglas-fir, Idaho fescue, lupine, needleandthread, and big sagebrush. Annual precipitation is 18 to 20 inches, the average annual soil temperature is 43° to 45° F, and the frost-free period is 70 to 85 days.

In a representative profile the surface layer is dark-brown sandy loam about 6 inches thick. The subsoil is dark-brown and yellowish-brown sandy loam about 9 inches thick. The substratum is yellowish-brown and brown sandy loam. Sandstone is at a depth of about 36 inches.

Permeability is rapid, and available water capacity is low. The effective rooting depth is about 3 feet. These soils are used for range, recreation, watershed, and game range.

Representative profile of Sawcreek sandy loam, in an area of Splitro-Sawcreek sandy loams, rolling, in grassland, 660 feet south and 1,320 feet west of the NE. corner sec. 17, T. 7 S., R. 26 E.

A11—0 to 2 inches, dark-brown (10YR 4/3) light sandy loam, very dark grayish brown (10YR 3/2) moist; weak, fine, granular structure; soft, friable, nonsticky and nonplastic; many very fine and micro roots; clear, smooth boundary.

A12—2 to 6 inches, dark-brown (10YR 4/3) sandy loam, very dark grayish brown (10YR 3/2) moist; weak, coarse, prismatic structure; slightly hard, friable, nonsticky and slightly plastic; many fine, very fine, and micro roots; gradual, wavy boundary.

B21—6 to 11 inches, dark-brown (10YR 4/3) sandy loam, dark brown (10YR 3/3) moist; moderate, coarse, prismatic structure; hard, friable, slightly sticky and slightly plastic; few micro roots; few micro pores; gradual, wavy boundary.

B22—11 to 15 inches, yellowish-brown (10YR 4/3) sandy loam, dark brown (10YR 4/3) moist; moderate, coarse, prismatic structure parting to moderate, coarse, blocky; hard, friable, slightly sticky and slighty plastic; few very fine roots; few very fine pores; gradual, wavy boundary.

C1—15 to 23 inches, yellowish-brown (10YR 5/3) sandy loam, dark brown (10YR 4/3) moist; weak, coarse, blocky structure; hard, friable, slightly sticky and slightly plastic; few micro roots; common micro pores; gradual, wavy boundary.

C2—23 to 36 inches, brown (10YR 5/3) light sandy loam, dark yellowish brown (10YR 4/4) moist; weak, coarse, blocky structure; hard, friable, nonsticky and slightly plastic; abrupt, wavy boundary.

R—36 inches, hard, noncalcareous sandstone.

Depth to bedrock ranges from 20 to 40 inches. The soil below a depth of 10 inches and above bedrock is sandy loam. The soil ranges from 0 to 15 percent coarse fragments. Hue is 10YR or 7.5YR throughout, and chroma is 2 or 3. The dark-colored surface layer ranges from 8 to 13 inches in thickness. The A1 horizon is dark brown and brown. The C horizon is brown, yellowish brown, and light yellowish brown.

Sawcreek soils in the Big Horn County Area are mapped only with Splitro soils.

Searing Series

The Searing series consists of moderately deep, undulating to hilly, well-drained soils in the sedimentary uplands. Slopes range from 4 to 35 percent. These soils formed in place in material weathered from burned shale and porcelanite rock. Elevation ranges from 3,500, to 5,000 feet.

The native vegetation is mainly dryland sedges, Idaho fescue, fringed sagewort, green sagewort, and cudweed sagewort. Annual precipitation is 15 to 17 inches, the average annual soil temperature is 45° to 47° F, and the frost-free period is 95 to 115 days.

In a representative profile the surface layer is dark reddish-gray loam about 6 inches thick. The subsoil is reddish-brown loam and clay loam about 18 inches thick. The substratum is red channery loam. Shale and sandstone are at a depth of about 30 inches.

Permeability is moderate. and available water capacity is low or moderate. The effective rooting depth is about 30 inches. These soils are used for range, wildlife, recreation, watershed, and dryfarmed crops.

Representative profile of Searing loam, undulating, in grassland, 300 feet west and 200 feet north of the SE corner sec. 9, T. 5 S., R. 38 E.

A11—0 to 2 inches, dark reddish-gray (5YR 4/2) loam, dark reddish brown (5YR 2/2) moist; weak, thin, platy structure parting to weak, coarse, granular; soft, very friable, nonsticky and slightly plastic; clear boundary.

A12—2 to 6 inches, dark reddish-gray (5YR 4/2) loam, dark reddish brown (5YR 2/2) moist; moderate, thick, platy structure; slightly hard, friable, nonsticky and slightly plastic; clear, smooth boundary.

B1—6 to 11 inches, reddish-brown (5YR 4/4) loam, dark reddish brown (5YR 3/3) moist; moderate, weak, prismatic structure parting to weak, medium, blocky; hard, friable, slightly sticky and plastic; clear, wavy boundary.

B2—11 to 17 inches, reddish-brown (2.5YR 5/4) clay loam, dark reddish brown (2.5YR 3/4) moist; moderate, medium, prismatic structure parting to moderate, medium, blocky; hard, friable, sticky and plastic; gradual, wavy boundary.

B3—17 to 24 inches, reddish-brown (2.5Y 5/4) loam, dark red (2.5Y 3/6) moist; moderate, fine and medium, blocky structure; hard, friable, sticky and plastic; gradual, wavy boundary.

C—24 to 30 inches, red (2.5Y 5/5) channery loam, dark red (2.5Y 4/6) moist; weak, medium, blocky structure; slightly hard, friable, slightly sticky and slightly plastic; 25 percent (volume) weathered shale and sandstone fragments; slightly effervescent; gradual, wavy boundary.

R—30 to 40 inches, interbedded red shale and sandstone; strongly effervescent.

Depth to shale and porcelanite ranges from 20 to 40 inches. Hue ranges from 5YR to 10R throughout. The soil between a depth of 10 inches and the bedrock is loam or light clay loam. The A and B horizons range from 10 to 24 inches in combined thickness. The A horizon is dark reddish gray, reddish gray, and weak red. The C horizon is red, reddish brown, and light red. The lower part of the C horizon ranges from 5 to 30 percent coarse fragments.

Searing loam, undulating (Sg).—This undulating soil is on wide ridges in dissected shale highlands. Slopes are 4 to 8 percent, and they range from 50 to 250 feet long. The soil has the profile described as representative of the series. Included in mapping are spots of Ringling channery loam.

Runoff is medium, and the hazard of erosion is moderate. This soil is used for wildlife, recreation, watershed, range, hay, and limited dryfarmed crops. Irregularly shaped areas and the spots of Ringling soils are limitations to use of this soil. Capability unit IIIe–2 dryland; Silty range site, 15- to 19-inch precipitation zone; windbreak suitability group 2M.

Searing loam, hilly (SH).—This hilly and steep soil is on hills in dissected shale highlands. Slopes are mostly 15 to 25 percent, but they range to 35 percent. Areas range from 100 to 300 acres in size. Slopes range from 300 to 800 feet long. The native vegetation consists of thick stands of sawlog and pole-size ponderosa pine and an understory of ninebark, oregongrape, and horsemint. The soil has a profile similar to the one described as representative of the series, but the surface layer and subsoil are 15 to 24 inches in combined thickness, and the material below a depth of 15 inches is 15 to 30 percent shale and sandstone fragments. Included in mapping are areas of Doney loam and Ringling channery loam along ridgetops.

Runoff is medium, and the hazard of erosion is moderate. This soil is used for woodland, watershed, recreation, and game range. The principal tree species is ponderosa pine. Western hawthorn and ash are scattered along streams and valley bottoms. The average site index for ponderosa pine is 70.

Timber harvest on this soil is not limited by terrain or soil characteristics. Access is along broad ridges and through wide valleys. Trees 12 inches or more in diameter are harvested. Release cutting is needed on the north faces of many valleys. Western hawthorn increases in many heavily logged areas. The hazard of wind breakage is moderate after heavy wet snow in spring. Piling and burning of slash helps to increase the cover of grass and reduce infestation of bark and pine beetles. Capability unit VIe–1 dryland; not placed in a range site or windbreak suitability group.

Searing-Ringling complex, rolling (Sl).—This complex is made up of rolling soils in the sedimentary uplands. It is 45 to 60 percent Searing loam, 30 to 45 percent Ringling stony loam, and 5 to 10 percent Reeder and Farnuf loam. Slopes are 8 to 15 percent. The Searing soil is on ridges and hillsides, in saddles between hills, and at the heads of drainageways. The Ringling soil is on hilltops, narrow ridges, and steep side slopes from which rock crops out.

Runoff is medium, and the hazard of erosion is moderate. These soils are used for wildlife, recreation, watershed, range, and pasture. Capability unit IVe–2 dryland; Silty range site, 15- to 19-inch precipitation zone; windbreak suitability group 3M.

Shaak Series

The Shaak series consists of deep, nearly level to strongly sloping and undulating to rolling, well-drained soils on hills and benches. Slopes range from 2 to 15 percent. These soils formed in clay loam and silty clay loam alluvium. Elevation ranges from 3,500 to 5,000 feet.

The native vegetation is mainly western wheatgrass, Sandberg bluegrass, fringed sagewort, blue grama, Idaho fescue, and prairie junegrass. Annual precipitation is 14 to 17 inches, the average annual soil temperature is 44° to 47° F, and the frost-free period is 90 to 105 days.

In a representative profile the surface layer is grayish-brown light clay loam about 3 inches thick. The subsoil is grayish-brown, brown, light olive-brown, and pale-olive silty clay loam, clay, and clay loam about 22 inches thick. The substratum is pale-olive and light

olive-gray clay loam that extends to a depth of 63 inches or more.

Permeability is slow, and available water capacity is high. The effective rooting depth is 60 inches or more. These soils are used for dryfarmed crops, wildlife, recreation, watershed, and range. They are suitable for irrigation.

Representative profile of Shaak clay loam, 4 to 8 percent slopes, in grassland, 1,000 feet north and 1,200 feet east of the SW. corner sec. 15, T. 5 S., R. 25 E.

A1—0 to 3 inches, grayish-brown (10YR 5/2) light clay loam, very dark grayish brown (10YR 3/2) moist; weak, very thin, platy structure; slightly hard, friable, slightly sticky and plastic; common very fine roots; many clean sand and silt grains; clear, smooth boundary.

B1—3 to 6 inches, grayish-brown (10YR 5/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; moderate, fine, blocky structure; hard, friable, very sticky and very plastic; common very fine roots; common very fine pores; few clean sand grains; clear, smooth boundary.

B21t—6 to 13 inches, brown (10YR 5/3) clay, dark yellowish brown (10YR 4/4) moist; moderate, medium, prismatic structure parting to strong, fine and very fine, blocky; very hard, very firm, very sticky and very plastic; common very fine roots; many very fine pores; moderately thick, patchy clay films on peds; gradual, wavy boundary.

B22t—13 to 18 inches, light olive-brown (2.5Y 5/4) heavy clay loam, olive brown (2.5Y 4/4) moist; strong, medium, prismatic structure parting to strong, medium and fine, blocky; very hard, firm, very sticky and very plastic; common very fine roots; many very fine pores; moderately thick, patchy clay films on peds; clear, wavy boundary.

B3—18 to 25 inches, pale-olive (5Y 6/3) heavy clay loam, olive (5Y 4/3) moist; weak, medium, prismatic structure parting to moderate, medium, blocky; few very fine roots; common very fine pores; slightly effervescent; few indistinct, very fine lime threads; gradual, wavy boundary.

C1ca—25 to 31 inches, pale-olive (5Y 6/3) clay loam, olive (5Y 4/3) moist; moderate, coarse, blocky structure; very hard, firm, sticky and plastic; few very fine roots; common very fine pores; strongly effervescent; few indistinct, very fine lime threads; gradual, wavy boundary.

C2ca—31 to 41 inches, light olive-gray (5Y 6/2) light clay loam, olive (5Y 4/3) moist; weak, coarse, blocky structure; hard, friable, sticky and plastic; few very fine roots; common very fine pores; strongly effervescent; common fine lime threads and soft lime masses; diffuse, wavy boundary.

C3—41 to 63 inches, pale-olive (5Y 6/3) clay loam, olive (5Y 4/3) moist; massive; hard, friable, sticky and plastic; few very fine pores; strongly effervescent.

Depth to calcareous material ranges from 10 to 19 inches. The A1 horizon is light brownish-gray, grayish-brown, and dark grayish-brown clay loam, loam, or silty clay loam that contains many clear sand grains. In places there is a light brownish-gray A2 horizon that has an abrupt lower boundary. The B2t horizon is brown, dark grayish-brown, and yellowish-brown heavy clay loam, silty clay, or clay that is 35 to 55 percent clay. The Bca and Cca horizons are light brownish-gray, pale-yellow, pale-olive, and light olive-gray clay loam, silty clay loam, or light clay. The lower part of the C horizon ranges from 0 to 20 percent coarse fragments.

Shaak clay loam, 4 to 8 percent slopes (Ska).—This soil is on narrow foot slopes, fans, and terraces. Slopes range from 150 to 300 feet long. The soil has the profile described as representative of the series.

Runoff is medium, and the hazard of erosion is moderate. Areas on foot slopes receive runoff from soils above them. This soil is used for irrigated and dryfarmed crops, hay, watershed, wildlife, recreation, and range. Capability unit IIIe–2 dryland, IVe–1 irrigated; Clayey range site, 15- to 19-inch precipitation zone; windbreak suitability group 1.

Shaak silty clay loam, 0 to 2 percent slopes (Skb).—This nearly level soil is on high terraces and benches. Drainageways are not distinct, and runoff collects on flat slopes and in shallow depressions. The soil has a profile similar to the one described as representative of the series, but it is less sloping and has a surface layer of silty clay loam.

Included with this soil in mapping are areas of Lennep loam, Xavier silty clay loam, and Shonkin loam. The Lennep and Shonkin soils are on the level areas and in slight depressions.

Runoff is slow, and the hazard of erosion is slight. This soil is used for irrigated and dryfarmed crops, hay, wildlife, recreation, watershed, and range. Capability unit IIs–2 dryland, IIIs–1 irrigated; Clayey range site, 15- to 19-inch precipitation zone; windbreak suitability group 1.

Shaak silty clay loam, gently undulating (Skc).—This gently undulating soil is on high terraces. Slopes are 2 to 4 percent. This soil has a profile similar to the one described as representative of the series, but it is less sloping and has a surface layer of silty clay loam. Included in mapping are areas of soils that have a surface layer of silty clay and areas of Xavier silty clay loam and Lennep loam.

Runoff is slow, and the hazard of erosion is slight. This soil is used for irrigated and dryfarmed crops, hay, wildlife, recreation, watershed, and range. Capability unit IIe–2 dryland, IIIe–3 irrigated; Clayey range site, 15- to 19-inch precipitation zone; windbreak suitability group 1.

Shaak silty clay loam, undulating (Skd).—This soil is on narrow ridges and in drainageways in dissected loess-mantled and gravelly benches. Slopes are 4 to 8 percent. Local relief ranges from 25 to 75 feet. The soil has a profile similar to the one described as representative of the series, but the surface layer is silty clay loam. Included in mapping are areas of soils that have a surface layer of silty clay and areas of Lennep loam.

Runoff is medium, and the hazard of erosion is moderate. This soil is used for dryfarmed crops, hay, wildlife, recreation, watershed, and range. It is also suited to limited irrigated crops. Capability unit IIIe–2 dryland, IVe–1 irrigated; Clayey range site, 15- to 19-inch precipitation zone; windbreak suitability group 1.

Shaak silty clay loam, rolling (Ske).—This soil is on smooth valley sides, hills, fans, and terraces on dissected shale highlands that are covered with a mantle of loess and gravelly material. Slopes are 8 to 15 percent and 50 to 300 feet long. Local relief ranges from 15 to 125 feet. The soil has a profile similar to the one described as representative of the series, but it is steeper, the surface layer is silty clay loam, and as much as 10 percent of the surface is covered by fragments of gravel and cobble size.

Included with this soil in mapping are areas of soils that have a surface layer of silty clay and areas of Judith gravelly loam, Wayden silty clay loam, and

Grail silty clay. These included soils make up 10 to 35 percent of the total area of this mapping unit.

Runoff is medium, and the hazard of erosion is moderate. This soil is used for wildlife, recreation, watershed, range, hay, pasture, and dryfarmed crops. Capability unit IVe–2 dryland; Clayey range site, 15- to 19-inch precipitation zone; windbreak suitability group 1.

Shaak complex, 4 to 15 percent slopes (SM).—This complex is made up of gently sloping and strongly sloping soils in the dissected shale highlands. It is 45 to 60 percent Shaak clay loam and 40 to 55 percent Doney loam, Dast sandy loam, and Absher clay. Typically, it is below a sandstone and shale headwall that rims major valleys. Areas extend from the headwall to the valley bottom. Where several valleys are separated by low broad ridges that have slopes of less than 20 percent, the headwall is absent. Drainageways between the ridges make local relief of 35 to 65 feet. The Shaak soil is on broad ridges and knolls, on side slopes to drainageways and at the heads of drainageways. The Doney and Dast soils are on narrow ridges and at points where tributary drainageways enter the main valley. The Absher soil is at the heads of drainageways and on wide ridges where slopes are 4 percent. The Shaak soil on ridges is underlain by shale at a depth of 30 to 40 inches.

Runoff is medium, and the hazard of erosion is moderate. These soils are used for wildlife, recreation, watershed, range, hay, and pasture. Capability unit IVe–2 dryland; Clayey range site, 15- to 19-inch precipitation zone; windbreak suitability group 2M.

Shale Outcrop

Shale outcrop (SOa) is on deeply dissected parts of shale uplands. The areas consist of a single shale escarpment or headwall or a combination of buttes, hills, and ridges that are 80 percent or more outcrops of soft shale. Along river valleys Shale outcrop in places is capped by terrace gravel 10 to 40 feet thick. In places the hilltops and ridgetops include patches of Norbert and Eltsac clays. Slopes range from 15 to 100 percent.

Runoff is very rapid, and the hazard of erosion is severe. The runoff water carries large amounts of sediment. The vegetation is mono lepis, white locoweed, and greasewood. Capability unit VIIIs–1 dryland; not placed in a range site or windbreak suitability group.

Shale outcrop-Midway complex, steep (SOc).—This complex is on deeply dissected clay shale highlands that have local relief of 50 to 200 feet. It is 35 to 70 percent shale outcrop and 25 to 65 percent Midway silty clay loam. Slopes are 25 to 90 percent. Areas occur as a single, nearly perpendicular escarpment along a valley or as a number of closely spaced narrow ridges and drainageways at the head of a valley. Single escarpment areas have one or two sandstone ledges that are 5 to 7 feet thick mixed with the shale. The Midway soil is on ridgetops, at the heads of drainageways, and on the lower third of escarpments. It has a profile similar to the one described as representative of the series, but it is steeper.

Runoff is rapid, and the hazard of erosion is severe. Erosion is active. Runoff waters carry large amounts of sediment. These soils are used for range, wildlife, recreation, and watershed. Capability unit VIIe–1 dryland; Shale range site, 10- to 14-inch precipitation zone; windbreak suitability group 4.

Shale outcrop-Norbert complex, hilly (SOd).—This complex is on dissected shale uplands in mountain foothills. It is about 60 percent Shale outcrop and 40 percent Norbert, Absher, Nobe, and Eltsac clays. Slopes are 15 to 75 percent. Areas range from 100 to 300 acres in size. The land surface is broken by many narrow, actively eroding drainageways. Between the drainageways are 1- to 15-acre, flat or gently rounded buttes, hills, and ridges. Local relief is 50 to 125 feet. Shale outcrop is on the steep sides of hills, ridges, and buttes and in drainageways. The Norbert and Eltsac soils are on ridgetops and hilltops. The Absher soil is on flat hills and buttes. The Nobe soil is along drainageways.

Runoff is rapid, and the hazard of erosion is severe. Runoff waters carry large amounts of sediment. These soils are used for range, recreation, watershed, and wildlife. Capability unit VIIe–1 dryland; Shale range site, 15- to 19-inch precipitation zone; windbreak suitability group 4.

Shonkin Series

The Shonkin series consists of deep, nearly level, somewhat poorly drained soils in shallow basins on high terraces. Slopes range from 0 to 1 percent. These soils formed in clay loam, silty clay loam, and clay alluvium. Elevation ranges from 3,400 to 4,000 feet.

The native vegetation is mainly sedges, western wheatgrass, barnyardgrass, and sour clover. Annual precipitation is 14 to 17 inches, the average annual soil temperature is 47° to 49° F, and the frost-free period is 105 to 115 days. Water ponds for a few days to a few weeks after the snow melts and after heavy rain.

In a representative profile the surface layer is light-gray clay loam about 7 inches thick. The subsoil is light olive-gray clay about 19 inches thick. The substratum is pale-olive silty clay that extends to a depth of 60 inches or more.

Permeability is slow, and available water capacity is high. The effective rooting depth is 60 inches or more. These soils are used for dryfarmed crops, wildlife, recreation, watershed, and range.

Representative profile of Shonkin clay loam, in a cultivated area, 990 feet north and 1,100 feet west of the SE. corner sec. 1, T. 3 S., R. 32 E.

Ap1—0 to 3 inches, light-gray (5Y 7/1) clay loam, olive gray (5Y 5/2) moist; moderate, thin, platy structure; slightly hard, friable, nonsticky and slightly plastic; abrupt, smooth boundary.

Ap2—3 to 7 inches, light-gray (5Y 7/1) clay loam, olive gray (5Y 5/2) moist; few fine (5Y 5/4 dry) mottels; moderate, thin, platy structure; slightly hard, friable, nonsticky and slightly plastic; abrupt, smooth boundary.

B21t—7 to 12 inches, light olive-gray (5Y 6/2) clay, olive gray (5Y 5/2) moist; moderate, coarse, prismatic structure parting to strong, fine and medium, blocky; very hard, very firm, very sticky and very plastic; moderately thick, patchy clay films on peds and partly filling fine pores; clear boundary.

B22t—12 to 19 inches, light olive-gray (5Y 6/2) clay, olive gray (5Y 5/2) moist; weak, medium, prismatic structure parting to strong, fine and medium, blocky; very hard, very firm, very sticky and very plastic; thin, patchy clay films on peds; clear boundary.

B3ca—19 to 26 inches, light olive-gray (5Y 6/2) clay, olive gray (5Y 5/2) moist; moderate, fine, blocky structure; very hard, very firm, very sticky and very plastic; slightly effervescent; clear boundary.

C1—26 to 36 inches, pale-olive (5Y 6/3) silty clay, olive (5Y 5/3) moist; weak, medium, subangular blocky structure; very hard, firm, sticky and very plastic; strongly effervescent; common coarse lime masses; clear boundary.

C2—36 to 60 inches, pale-olive (5Y 6/3) silty clay, olive (5Y 5/3) moist; massive; hard, firm, sticky and very plastic; strongly effervescent; common coarse lime masses; few rounded pebbles in lower part.

The A and B horizons range from 16 to 28 inches in combined thickness. The A horizon is light brownish gray and light gray in chroma of 1 or 2. The B2t horizon is light olive-gray, grayish-brown, and light olive-brown silty clay or clay. Sodium saturation ranges from 5 to 10 percent in the lower part of the B horizon and increases with increasing depth in the C horizon. The lower part of the C horizon in places contains gypsum crystals.

Shonkin clay loam (Sp).—This soil is in closed depressions and swales in high terraces and benches. Slopes are 0 to 1 percent. Areas range from 2 to 15 acres in size.

Runoff is none to slow, and the hazard of erosion is slight. Flooding in spring and early in summer occurs about 1 year out of 3. The depth of the water ranges from 1½ to 3 feet. Crop damage varies with the water depth and time of flooding. This soil is used for dryfarmed crops, hay, wildlife, recreation, watershed, and range. Capability unit IIIw–2 dryland; Overflow range site, 10- to 14-inch precipitation zone; windbreak suitability group 1.

Sofia Series

The Sofia series consists of deep, nearly level and gently undulating, well-drained soils on terraces and fans. Slopes range from 0 to 4 percent. These soils formed in calcareous silty clay loam or silty clay alluvium. Elevation ranges from 3,500 to 4,000 feet.

The native vegetation is mainly green needlegrass, prairie junegrass, and western wheatgrass. Annual precipitation is 15 to 16 inches, the average annual soil temperature is 47° to 49° F, and the frost-free period is 100 to 115 days.

In a representative profile the surface layer is brown silty clay about 7 inches thick. The subsoil is dark-brown and brown silty clay about 9 inches thick. The substratum is pale-brown silty clay. Unconformable very gravelly sand is at a depth of 40 inches.

Permeability is slow, and available water capacity is high. The effective rooting depth is 40 inches or more. These soils are used for dryfarmed crops, wildlife, recreation, watershed, and range. They are suitable for irrigation.

Representative profile of Sofia silty clay, 0 to 2 percent slopes, in a cultivated area, 2,500 feet north and 200 feet east of the SW. corner sec. 32, T. 4 S., R. 32 E.

Ap—0 to 7 inches, brown (10YR 5/3) silty clay, dark brown (10YR 3/3) moist; weak, blocky structure parting to moderate, fine, granular; very hard, firm, very sticky and very plastic; abrupt, smooth boundary.

B2t—7 to 12 inches, dark-brown (10YR 4/3) heavy silty clay, dark brown (10YR 3/4) moist; weak, medium, prismatic structure parting to strong, medium and fine, blocky; very hard, very firm, very sticky and very plastic; few very fine and fine roots; common very fine and fine and few medium tubular pores; continuous, organically stained films on faces of peds; clear boundary.

B3—12 to 16 inches, brown (10YR 5/3) silty clay, dark brown (10YR 4/3) moist; weak, medium, prismatic structure parting to moderate, medium and fine, blocky; very hard, firm, very sticky and plastic; few very fine roots; common very fine and fine and few medium tubular pores; slightly effervescent; clear, wavy boundary.

C1—16 to 22 inches, pale-brown (10YR 6/3) light silty clay, brown (10YR 5/3) moist; moderate, medium, blocky structure; very hard, firm, very sticky and plastic; few very fine and fine roots; common very fine and fine and few medium tubular pores; strongly effervescent; gradual boundary.

C2ca—22 to 40 inches, pale-brown (10YR 6/3) light silty clay, brown (10YR 5/3) moist; weak, coarse, blocky structure; very hard, firm, very sticky and plastic; few very fine and fine roots; common very fine and fine and few medium tubular pores; strongly effervescent; few increasing to common fine and medium lime masses; clear, wavy boundary.

IIC3—40 to 50 inches, very gravelly sand.

Depth to calcareous material ranges from 10 to 14 inches. Depth to very gravelly sand ranges from 40 to 60 inches. Hue is 10YR or 2.5Y throughout. The dark-colored surface layer ranges from 7 to 10 inches in thickness. The Ap horizon is brown, grayish brown, and light olive brown. The A and B horizons range from 12 to 18 inches in combined thickness. The B2t horizon ranges from 50 to 60 percent clay and is dark brown, brown, and light olive brown. The Cca horizon has few to many lime masses.

Sofia silty clay, 0 to 2 percent slopes (Sra).—This nearly level soil is on high benches, fans, and terraces. The gently undulating slopes between level swales and troughs range from 75 to 200 feet long. The soil has the profile described as representative of the series. Included in mapping on fans are areas of soils that have a surface layer of silty clay loam.

Runoff is slow, and the hazard of erosion is slight. This soil is used for irrigated and dryfarmed crops, hay, wildlife, recreation, and range. Capability unit IIs–2 dryland, IIs–1 irrigated; Clayey range site, 10- to 14-inch precipitation zone; windbreak suitability group 1.

Sofia silty clay, gently undulating (Srb).—This gently undulating soil is on high terraces. Slopes are 2 to 4 percent. The soil has a profile similar to the one described as representative of the series, but it is steeper.

Runoff is slow, and the hazard of erosion is slight. This soil is used for irrigated and dryfarmed crops, hay, wildlife, recreation, and range. Capability unit IIe–2 dryland, IIIe–3 irrigated; Clayey range site, 10- to 14-inch precipitation zone; windbreak suitability group 1.

Spearfish Series

The Spearfish series consists of shallow, rolling to very steep, well-drained soils on dissected sedimentary uplands. Slopes range from 8 to 50 percent. These soils formed in place in material weathered from red shale

and sandstone. Elevation ranges from 4,200 to 5,000 feet.

The native vegetation is mainly Hoods phlox, bluebunch wheatgrass, big sagebrush, needleandthread, and broom snakeweed. Annual precipitation is 12 to 14 inches, the average annual soil temperature is 47° to 49° F, and the frost-free period is 100 to 110 days.

In a representative profile the surface layer is reddish-brown loam about 3 inches thick. The underlying material is red silty clay loam. Platy shale is at a depth of about 15 inches.

Permeability is moderate, and available water capacity is very low. The effective rooting depth is about 15 inches. These soils are used for range, watershed, recreation, and winter game range.

Representative profile of Spearfish loam, in an area of Spearfish-Clapper complex, hilly, in grassland, 1,000 feet west and 100 feet south of the NE. corner sec. 10, T. 9 S., R. 29 E.

A1—0 to 3 inches, reddish-brown (2.5YR 5/4) heavy loam, reddish brown (2.5YR 4/4) moist; weak, medium, platy structure; slightly hard, friable, slightly sticky and slightly plastic; slightly effervescent; few angular limestone fragments of pebble size; clear, smooth boundary.

C1—3 to 10 inches, red (2.5YR 5/6) light silty clay loam, red (2.5YR 4/6) moist; weak, fine, blocky structure; hard, friable, sticky and plastic; strongly effervescent; clear, wavy boundary.

C2ca—10 to 15 inches, red (2.5YR 5/6) silty clay loam, red (2.5YR 4/6) moist; weak, fine, blocky structure; hard, friable, sticky and plastic; strongly effervescent; few segregated lime threads and masses; gradual, wavy boundary.

C3—15 to 21 inches, red (2.5YR 5/6) platy shale.

Depth to bedrock ranges from 10 to 20 inches. The soil is loam or silty clay loam throughout. It ranges from 0 to 15 percent coarse fragments of red shale and pink or white limestone. Hue ranges from 2.5YR to 10R throughout. The A1 horizon is reddish brown and weak red. The C horizon is light red, red, and pale red.

Spearfish-Clapper complex, hilly (SSa).—This complex is made up of hilly and steep soils in the sedimentary uplands. It is 45 to 60 percent Spearfish loam and 35 to 50 percent Clapper gravelly and cobbly loam. Slopes are 15 to 35 percent. The Spearfish soil is on the lower sides of valleys and narrow drainageways. Fragments of pebble size are common on the surface. The Clapper soil is on valley rims, ridges between valleys, and the upper sides of valleys. It has slopes of mostly 25 to 35 percent. The Spearfish soil in this complex has the profile described as representative of the Spearfish series. The Clapper soil has a profile similar to the one described as representative of the Clapper series, but it is steeper. Coarse fragments in the Clapper soil are mainly limestone, and in places the soil is reddish brown and light reddish brown. Included in mapping are spots of Chugter loam on the valley bottoms.

Runoff is rapid, and the hazard of erosion is severe. These soils are used for range, wildlife, watershed, and recreation. Capability unit VIe–1 dryland; Shallow range site, 10- to 14-inch precipitation zone; windbreak suitability group 4.

Spearfish-Rock outcrop complex, very steep (SSb).—This complex is made up of steep and very steep soils in the sedimentary uplands. It is 35 to 45 percent Spearfish loam, 15 to 30 percent Rock outcrop, 15 to 20 percent Pultney loam, and 5 to 35 percent Travessilla channery loam and sandy loam. Slopes are 35 to 90 percent. The soils are intermixed. They have sandstone, limestone, and shale fragments of channer and cobble size on the surface. Rock outcrop in this complex consists of red, pink, gray, brown, and reddish-brown limestone, dolomite, chert, sandstone, and shale that have slopes of 50 to 90 percent. The Spearfish soil in this complex has a profile similar to the one described as representative of the Spearfish series, but it is steeper. Included in mapping are areas of silty clay loam soils.

Runoff is rapid, and the hazard of erosion is severe. These soils are used for range, recreation, watershed, and game range. Capability unit VIIe–1 dryland; Thin Breaks range site, 10- to 14-inch precipitation zone; windbreak suitability group 4.

Spearfish-Pultney association, rolling (SSc).—This association is made up of rolling and hilly soils in the sedimentary uplands. It is about 55 percent Spearfish loam, 30 percent Pultney loam, and 10 percent La Fonda loam. Slopes are 8 to 25 percent. The La Fonda soil is on the lower sides and in the bottoms of wide drainageways. The Pultney soil is on ridgetops and above limestone ledges. The Spearfish and Pultney soils in this association have profiles similar to the ones described as representative of their respective series, but they are steeper. Channery fragments and fragments of gravel size cover 5 to 20 percent of the surface of all the soils in this mapping unit. Included in mapping are areas of Spearfish soils that have a surface layer of silty clay loam.

Runoff is rapid, and the hazard of erosion is severe. These soils are used for range, wildlife, recreation, and watershed. Capability unit VIe–1 dryland; Shallow range site, 10- to 14-inch precipitation zone; windbreak suitability group 4.

Spearfish-Pultney association, hilly (SSd).—This association is made up of hilly and very steep soils in the sedimentary uplands. It is about 60 percent Spearfish loam, 20 percent Pultney loam, and 20 percent La Fonda loam and Rock outcrop. Slopes are mostly 15 to 35 percent, but they range to 50 percent. The Spearfish soil is mainly on valley sides where slopes range from 25 to 50 percent. The Pultney soil is on ridgetops and in narrow valleys. The La Fonda soil is on foot slopes at the heads of valleys. The Pultney soil in this association has a profile similar to the one described as representative of the Pultney series, but it is steeper. Included in mapping are areas of Spearfish soils that have a surface layer of silty clay loam.

Runoff is rapid, and the hazard of erosion is severe. These soils are used for range, wildlife, recreation, and watershed. Capability unit VIe–1 dryland; Thin Hilly range site, 10- to 14-inch precipitation zone; windbreak suitability group 4.

Spearman Series

The Spearman series consists of moderately deep, undulating and rolling, well-drained soils on dissected sedimentary uplands. Slopes range from 4 to 15 percent. These soils formed in place in material weathered

from platy, red, burned shale and sandstone. Elevation ranges from 3,500 to 4,000 feet.

The native vegetation is mainly needleandthread, western wheatgrass, big sagebrush, and broom snakeweed. Annual precipitation is 12 to 14 inches, the average annual soil temperature is 48° to 49° F, and the frost-free period is 105 to 110 days.

In a representative profile the surface layer is reddish-brown loam and clay loam about 4 inches thick. The subsoil is reddish-brown clay loam about 11 inches thick. The substratum is light reddish-brown channery loam. Fragmented hard shale is at a depth of about 23 inches, and hard shale or sandstone is at a depth of 25 inches.

Permeability is moderate, and available water capacity is low. The effective rooting depth is about 30 inches. These soils are used for range, wildlife, recreation, watershed, and dryfarmed crops.

Representative profile of Spearman loam, undulating, in grassland, 900 feet east and 1,000 feet north of the SW. corner sec. 1, T. 1 S., R. 37 E.

A11—0 to 2 inches, reddish-brown (5YR 5/3) heavy loam, dark reddish brown (5YR 3/3) moist; moderate, thin, platy structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine roots; many very fine interstitial pores; clear, smooth boundary.

A12—2 to 4 inches, reddish-brown (5YR 5/3) light clay loam, dark reddish brown (5YR 3/3) moist; weak, medium, prismatic structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; many very fine and fine tubular pores; clear, wavy boundary.

B2—4 to 15 inches, reddish-brown (5YR 5/4) light clay loam, dark reddish brown (5YR 3/4) moist; moderate, medium, prismatic structure parting to moderate, medium, blocky; hard, friable, slightly sticky and slightly plastic; many very fine roots; many very fine and few fine tubular pores; few burned shale fragments; gradual, wavy boundary.

C1—15 to 19 inches, light reddish-brown (5YR 6/4) channery loam, yellowish red (5YR 4/6) moist; weak, fine, blocky structure; hard, friable, slightly sticky and slightly plastic; many very fine roots; common very fine and few fine tubular pores; 15 percent flat, burned shale fragments; clear, wavy boundary.

C2—19 to 23 inches, light reddish-brown (5YR 6/6) channery loam, yellowish red (5YR 4/6) moist; massive; hard, friable, slightly sticky and slightly plastic; many very fine roots; common very fine and few fine tubular pores; 30 percent flat, burned shale fragments; strongly effervescent; lime crusts on bottoms of shale fragments; abrupt, wavy boundary.

C3—23 to 25 inches, fragmented, hard, red, burned shale; roots matted between shale layers.

R—25 inches, hard shale or sandstone.

Depth to platy shale and sandstone ranges from 20 to 40 inches. Hue ranges from 7.5YR to 10R throughout. The A and B horizons range from 2 to 10 percent shale fragments, and the C horizon, from 10 to 35 percent. The A horizon is weak red, reddish brown, dark reddish brown, and brown. The B2 horizon is reddish brown, dark reddish brown, yellowish red, red, and light red. The B2 and C1 horizons range from 20 to 30 percent clay.

Spearman loam, undulating (St).—This soil is in 10- to 30-acre areas on wide ridges in the burned shale highlands. Slopes are 4 to 8 percent. The soil has the profile described as representative of the series. Included in mapping are areas of Cushman loam, Thedalund loam, and Wibaux channery loam along ridgetops.

Runoff is medium, and the hazard of erosion is moderate. This soil is used for dryfarmed crops, hay, wildlife, recreation, watershed, and range. The included spots of Wibaux soils interfere with tillage. Capability unit IIIe–3 dryland; Silty range site, 10- to 14-inch precipitation zone; windbreak suitability group 2M.

Spearman-Wibaux complex, rolling (SU).—This complex is made up of undulating and rolling soils in the sedimentary uplands. It is 40 to 60 percent Spearman loam, 30 to 50 percent Wibaux loam and Wibaux stony loam, and 5 to 20 percent Thedalund loam. Slopes are mostly 8 to 15 percent, but they range to 4 percent. The Spearman soil is in swales between hills, on wide ridges, and at the heads of drainageways. The Wibaux soils are around and on low knolls, narrow ridges, and side slopes. The Thedalund soil is on the highest hilltops. Included in mapping with the Wibaux soils in places are ledges of sandstone and some porcelanite boulders.

Runoff is rapid, and the hazard of erosion is severe. These soils are used for wildlife, recreation, watershed, range, hay, pasture, and dryfarmed crops. Capability unit IVe–3 dryland; Silty range site, 10- to 14-inch precipitation zone; windbreak suitability group 3M.

Splitro Series

The Splitro series consists of shallow, steep and rolling and hilly, well-drained soils on hills and ridges in the sedimentary uplands. Slopes range from 8 to 35 percent. These soils formed in place in material weathered from noncalcareous sandstone. Elevation ranges from 4,800 to 6,000 feet.

The native vegetation is mainly dryland sedges, big sagebrush, wild geranium, Idaho fescue, Douglas-fir, and limber pine. Annual precipitation is 18 to 20 inches, the average annual soil temperature is 45° to 46° F, and the frost-free period is 70 to 85 days.

In a representative profile the surface layer is dark-brown sandy loam about 3 inches thick. The subsoil is dark-brown sandy loam about 6 inches thick. The underlying material is brown sandy loam. Hard sandstone is at a depth of about 13 inches.

Permeability is moderately rapid, and available water capacity is very low. The effective rooting depth is about 15 inches. These soils are used for range, recreation, watershed, and game range.

Representative profile of Splitro sandy loam, in an area of Splitro-Sawcreek sandy loams, rolling, in grassland, 1,320 feet south and 1,320 feet west of the NE. corner sec. 17, T. 7 S., R. 26 E.

A1—0 to 3 inches, dark-brown (10YR 4/3) light sandy loam, very dark grayish brown (10YR 3/2) moist; weak, medium, granular structure; soft, very friable, nonsticky and nonplastic; many fine and very fine roots; clear, smooth boundary.

B2—3 to 9 inches, dark-brown (10YR 4/3) sandy loam, dark brown (10YR 3/3) moist; weak, coarse, prismatic structure; slightly hard, friable, nonsticky and slightly plastic; few medium and common very fine roots; few very fine pores; few fine sandstone fragments; gradual, wavy boundary.

C—9 to 13 inches, brown (10YR 5/3) sandy loam, dark brown (10YR 4/3) moist; weak, medium, blocky structure; slightly hard, friable, nonsticky and slightly plastic; common very fine roots; many

very fine pores; few fine sandstone fragments; abrupt, wavy boundary.
R—13 to 15 inches, hard, noncalcareous sandstone.

Depth to bedrock ranges from 10 to 20 inches. The soil ranges from 5 to 30 percent coarse fragments. Hue is 10YR or 7.5YR throughout. The dark-colored surface layer ranges from 6 to 10 inches in thickness. The B2 horizon is dark brown, brown, and grayish brown.

Splitro-Sawcreek sandy loams, rolling (SVa).—This complex is made up of rolling soils on ridges and hillsides at the heads of deep drainageways. It is about 55 percent Splitro sandy loam, 35 percent Sawcreek sandy loam, and 10 percent Rock outcrop. Slopes are 8 to 15 percent. Relief ranges from 35 to 125 feet. Slopes range from 50 to 250 feet long. The soils occur in no definite pattern, but the Sawcreek soil is below the low rock ledges and on the sides and bottoms of drainageways. The areas of bare rock are typically surrounded by the Splitro soil. The Splitro and Sawcreek soils in this complex have the profiles described as representative of their respective series.

Runoff is medium, and the hazard of erosion is moderate. These soils are used for range, watershed, recreation, and game range. Capability unit VIe–1 dryland; Sandy range site, 20- to 24-inch precipitation zone; windbreak suitability group 3M.

Splitro-Sawcreek sandy loams, hilly (SVb).—This complex is made up of hilly soils on ridges and hills. It is 40 to 55 percent Splitro sandy loam, 20 to 30 percent Sawcreek sandy loam, 15 to 20 percent Rock outcrop, and as much as 25 percent Teton loam and Adel loam. Slopes are mostly 15 to 25 percent, but they range to 35 percent. Sandstone ledges, 5 to 20 feet high, make sharp slope breaks on the hillsides and ridges. Relief ranges from 75 to 200 feet. The Sawcreek, Teton, and Adel soils are on 12 to 30 percent slopes below the sandstone ledges. The Splitro soil is about the rock ledges and around areas of Rock outcrop. Slopes are 15 percent on ridgetops and 25 to 35 percent along the rock ledges. The Splitro and Sawcreek soils in this complex have profiles similar to the ones described as representative of their respective series, but they are steeper.

Runoff is rapid, and the hazard of erosion is severe. These soils are used for range, watershed, recreation, and game range. Capability unit VIe–1 dryland; Sandy range site, 20- to 24-inch precipitation zone; windbreak suitability group 4.

Stormitt Series

The Stormitt series consists of deep, well-drained, nearly level to steep and hilly soils on fans, foot slopes, and benches. Slopes range from 0 to 35 percent. These soils formed in gravelly and cobbly alluvium derived from mixed limestone, quartzite, and shale rock. Elevation ranges from 4,000 to 4,900 feet.

The native vegetation is mainly Hoods phlox, big sagebrush, black sagebrush, dryland sedges, blue grama, and prairie junegrass. Annual precipitation is 10 to 12 inches, the average annual soil temperature is 47° to 49° F, and the frost-free period is 100 to 110 days.

In a representative profile the surface layer is brown loam about 4 inches thick. The subsoil is light-brown loam about 3 inches thick. The substratum is light-brown loam that grades to pink gravelly loam and very gravelly loam that extends to a depth of 60 inches or more. About half of the substratum, by volume, is limestone, chert, and siltstone fragments of gravel and cobble size.

Permeability and available water capacity are moderate. The effective rooting depth is 50 inches or more. These soils are used for range, wildlife, recreation, and watershed.

Representative profile of Stormitt loam, in an area of Stormitt complex, 0 to 4 percent slopes, in grassland, 100 feet west and 100 feet south of the NE. corner sec. 9, T. 7 S., R. 25 E.

A11—0 to 1 inch, brown (7.5YR 5/2) loam, dark brown (7.5YR 3/2) moist; weak, very fine, granular structure; soft, very friable, nonsticky and slightly plastic; 7 percent (volume) limestone and chert fragments of pebble size; clear, smooth boundary.
A12—1 inch to 4 inches, brown (7.5YR 4/2) loam, dark brown (7.5YR 3/2) moist; weak, medium, platy structure; slightly hard, friable, nonsticky and slightly plastic; 5 percent (volume) limestone and chert fragments of pebble size; clear, smooth boundary.
B—4 to 7 inches, light-brown (7.5YR 6/4) loam, brown (7.5YR 5/4) moist; moderate, coarse, prismatic structure; hard, friable, slightly sticky and slightly plastic; 5 percent (volume) limestone and chert fragments of pebble size; slightly effervescent; clear, wavy boundary.
C1—7 to 10 inches, light-brown (7.5YR 6/4) loam, brown (7.5YR 5/4) moist; weak, coarse, prismatic structure; hard, friable, sticky and plastic; 10 percent (volume) limestone and chert fragments of pebble size; strongly effervescent; lime casts on pebbles; gradual, wavy boundary.
C2ca—10 to 17 inches, pink (7.5YR 7/4) gravelly loam, light brown (7.5YR 6/4) moist; massive; hard, friable, slightly sticky and slightly plastic; 30 percent (volume) limestone and chert fragments of pebble size; violently effervescent; lime casts on pebbles.
C3—17 to 24 inches, pink (7.5YR 7/4) very gravelly loam, light brown (7.5YR 6/4) moist; massive; hard, friable, slightly sticky and slightly plastic; 50 percent (volume) limestone and siltstone fragments of pebble and cobble size; violently effervescent; lime casts on pebbles and cobbles; diffuse boundary.
C4—24 to 42 inches, pink (5YR 7/4) very gravelly loam, light reddish brown (5YR 6/4) moist; massive; soft, very friable, nonsticky and nonplastic; violently effervescent; 60 percent (volume) limestone and siltstone fragments of pebble and cobble size.
C5—42 to 60 inches, very gravelly loam.

Content of pebbles, cobbles, and stones increases with increasing depth and averages 35 to 60 percent (volume) between depths of 10 and 40 inches. Hue ranges from 10YR to 5YR throughout. The A horizon is grayish-brown, light-brown, and brown loam or gravelly loam. The Cca horizon is pink, very pale brown, and pinkish gray. It has a 30- to 45-percent calcium carbonate equivalent.

Stormitt extremely stony loam, hilly (Swa).—This strongly sloping to steep and hilly soil is on 1- to 2-mile long fans. These fans are crossed by drainageways, 50 to 100 feet deep, at 1/2- to 3/4-mile intervals. Slopes are mostly 15 to 35 percent, but they range to 8 percent. They are 12 to 20 percent at the base of the

mountain front, 8 to 15 percent at the lower ends of the fans, and 35 percent on the sides of the major drainageways. The soil has a profile similar to the one described as representative of the series, but it is steeper, and stones and boulders cover 10 to 50 percent of the surface.

Included with this soil in mapping are areas of soils that have a surface layer of bouldery loam and spots of Harvey loam that has gravel scattered on the surface.

Runoff is rapid, and the hazard of erosion is severe. This soil is used for range, wildlife, recreation, and watershed. Capability unit VIIs–1 dryland; Silty range site, 10- to 14-inch precipitation zone; windbreak suitability group 3L.

Stormitt complex, 0 to 4 percent slopes (Swb).—This complex is made up of nearly level and gently undulating soils on fans and benches. It is 50 to 65 percent Stormitt gravelly loam and 35 to 50 percent Stormitt loam. It is mainly along the braided channels where surface gravel is common. The Stormitt loam soils in this complex has the profile described as representative of the Stormitt series. The Stormitt gravelly loam soil has a profile similar to the one described as representative of the Stormitt series, but the surface layer is gravelly loam.

Runoff is slow, and the hazard of erosion is severe. Spring flooding occurs in localized areas. These soils are used for range, wildlife, recreation, watershed, hay, and pasture. Capability unit IVs–2 dryland; Shallow to Gravel range site, 10- to 14-inch precipitation zone; windbreak suitability group 3M.

Stormitt complex, 4 to 15 percent slopes (SX).—This complex is made up of sloping and strongly sloping soils on fans and foot slopes. It is about 55 percent Stormitt loam and Stormitt gravelly loam, 35 percent Haverson loam, and 10 percent La Fonda loam. The Stormitt soils are on fans and foot slopes. The Haverson soil is on flood plains. The La Fonda soil is on fans that have no surface gravel. The Stormitt and Haverson soils in this complex have profiles similar to the ones described as representative of their respective series, but they are steeper, and the Stormitt loam soil has a surface layer of loam.

Runoff is medium, and the hazard of erosion is moderate. These soils are used for watershed, recreation, wildlife, range, hay, and pasture. Capability unit IVs–2 dryland; Silty range site, 10- to 14-inch precipitation zone; windbreak suitability group 3M.

Talag Series

The Talag series consists of deep, nearly level to gently sloping, well-drained, sodium-affected soils on fans, terraces, and foot slopes. Slopes range from 0 to 8 percent. These soils formed in deep, calcareous clay loam alluvium. Elevation ranges from 3,000 to 3,700 feet.

The native vegetation is mainly western wheatgrass, blue grama, cudweed, sagewort, silver sagebrush, and prairie junegrass. Annual precipitation is 13 to 14 inches, the average annual soil temperature is 48° to 50° F, and the frost-free period is 110 to 125 days.

In a representative profile the surface layer is light brownish-gray loam about 3 inches thick. The next layer is grayish-brown clay about 2 inches thick. The subsoil is dark-brown and light olive-brown clay about 17 inches thick. The substratum is grayish-brown stratified clay loam and silty clay loam that extends to a depth of 60 inches or more.

Permeability is very slow, and available water capacity is high. The effective rooting depth is 60 inches or more. These soils are used for range, wildlife, recreation, and watershed.

Representative profile of Talag clay, 0 to 8 percent slopes, in grassland, 720 feet north and 1,000 feet east of the SW. corner sec. 24, T. 4 S., R. 28 E.

A2—0 to 3 inches, light brownish-gray (10YR 6/2) loam, very dark grayish brown (10YR 3/2) moist; moderate, thin, platy structure; slightly hard, very friable, nonsticky and nonplastic; common very fine roots; few fine and medium and common very fine tubular pores; plates coated with unstained silt and fine sand; clear, smooth boundary.

B&A—3 to 5 inches, grayish-brown (10YR 5/2) clay coated with light brownish-gray (10YR 6/2) uncoated silt and sand, dark grayish brown (10YR 4/2) moist; moderate, medium, prismatic structure parting to strong, medium, platy; hard, friable, sticky and plastic; common very fine roots; few fine and medium and common very fine tubular pores; thin, patchy clay films on peds; clear, wavy boundary.

B21t—5 to 13 inches, dark-brown (10YR 4/3) clay, dark brown (10YR 3/3) moist; strong, medium, prismatic structure parting to strong, medium, blocky; very hard, very firm, very sticky and very plastic; few very fine roots; common very fine tubular pores; continuous, thin clay films that have a value of 2 dry or moist on peds; clear, wavy boundary.

B22t—13 to 18 inches, light olive-brown (2.5Y 5/4) clay; olive brown (2.5Y 4/4) moist; moderate, coarse, prismatic structure parting to strong, medium, blocky; very hard, very firm, very sticky and very plastic; few very fine roots; few fine and common very fine tubular pores; patchy clay films on peds; clear, wavy boundary.

B3—18 to 22 inches, light olive-brown (2.5Y 5/4) clay, olive brown (2.5Y 4/4) moist; moderate, coarse, prismatic structure parting to moderate, medium, blocky; very hard, firm, very sticky and very plastic; few very fine roots; few fine and common very fine tubular pores; thin, patchy clay films on peds; slightly effervescent; few lime threads; gradual, wavy boundary.

C1ca—22 to 31 inches, grayish-brown (2.5Y 5/2) heavy clay loam, dark grayish brown (2.5Y 4/2) moist; medium, blocky structure; very hard, firm, sticky and plastic; few very fine roots; few fine and common very fine tubular pores; strongly effervescent; common threads and masses of lime; gradual, wavy boundary.

C2—31 to 60 inches, grayish-brown (2.5Y 5/2) stratified clay loam and silty clay loam, dark grayish brown (2.5Y 4/2) moist; massive; hard, firm, sticky and plastic; few roots; common very fine tubular pores; few hard shale and sandstone fragments; strongly effervescent; lime coatings on shale and sandstone fragments.

The A2 horizon is light brownish gray and grayish brown in hue of 2.5Y or 10YR and chroma of 2 or 3. The A&B or B&A horizon ranges from silty clay loam to clay loam. The B2t horizon ranges from 50 to 60 percent clay. It is dark brown, light olive brown, and brown. It is 5 to 10 percent exchangeable sodium in the upper part, and 10 to 20 percent in the lower part.

Talag clay, 0 to 8 percent slopes (Taa).—This soil is on terraces and fans. Areas range from 10 to 15 acres

in size. Slopes are mostly 1 to 3 percent, but they are 7 to 8 percent along terrace breaks and on fans or at the bases of hills. The soil has the profile described as representative of the series. Included in mapping are spots of Allentine clay, which has a thin cover of plants.

Runoff is medium, and the hazard of erosion is moderate. This soil is used for range, wildlife, recreation, and watershed. Capability unit VIs–1 dryland; Clayey range site, 10- to 14-inch precipitation zone; windbreak suitability group 3S.

Talag-Allentine complex, 0 to 4 percent slopes (Tab).—This complex is made up of nearly level and gently sloping soils on terraces and fans. It is 75 to 85 percent Talag silty clay loam and 15 to 25 percent Allentine clay. Areas range from 10 to 30 acres in size. The thin cover of stunted plants marks the Allentine soil in areas of range, and the surface clods identify it in cultivated fields. The Talag soil in this complex has a profile similar to the one described as representative of the Talag series, but the surface layer is silty clay loam. The Allentine soil has the profile described as representative of the Allentine series.

Runoff is slow, and the hazard of erosion is slight. These soils are used for range, wildlife, recreation, and watershed. Capability unit VIs–1 dryland; Pan Spots range site, 10- to 14-inch precipitation zone; windbreak suitability group 3S.

Tarrete Series

The Tarrete series consists of moderately deep, strongly sloping to steep and rolling to hilly, well-drained soils in the sedimentary highlands. Slopes range from 8 to 35 percent. These soils formed in material weathered in place from red clay shale. Elevation ranges from 5,800 to 7,000 feet.

The native vegetation is mainly cinquefoil, green needlegrass, Douglas-fir, rough fescue, and big sagebrush. Annual precipitation is 18 to 22 inches, the average annual soil temperature is 42° to 45° F, and the frost-free period is 60 to 75 days.

In a representative profile the surface layer is dark reddish-brown loam about 4 inches thick. The subsoil is red and light-red silty clay and clay about 19 inches thick. The substratum is light-red clay that extends to a depth of about 60 inches. A few chert and limestone fragments of gravel size occur throughout the soil.

Permeability is slow, and available water capacity is high. The effective rooting depth is 60 inches or more. These soils are used for grazing, watershed, recreation, and game range.

Representative profile of Tarrete silty clay loam, in an area of Duncom-Tarrete association, rolling, in grassland, 2,000 feet south and 500 feet east of the NW. corner sec. 24, T. 9 S., R. 30 E.

A1—0 to 4 inches, dark reddish-brown (2.5YR 3/4) loam, dark reddish brown (2.5YR 2/4) moist; strong, coarse, granular structure; slightly hard, friable slightly sticky and slightly plastic; common fine and very fine roots; few fine chert fragments of pebble size; clear, smooth boundary.

B21—4 to 7 inches, red (10R 5/6) silty clay, red (10R 4/6) moist; moderate, fine, blocky structure; very hard, firm, very sticky and very plastic; common fine and very fine roots; thin, patchy clay films on peds; few chert fragments of pebble size; very slightly effervescent; clear, wavy boundary.

B22ca—7 to 15 inches, red (10R 5/6) clay, red (10R 4/6) moist; weak, medium, prismatic structure parting to moderate, fine, blocky; very hard, very firm, very sticky and very plastic; common very fine roots; few chert fragments of pebble size; strongly effervescent; few fine lime threads; clear, wavy boundary.

B3ca—15 to 23 inches, light-red (10R 6/6) clay, red (10R 5/6) moist; moderate, fine, blocky structure; extremely hard, very firm, very sticky and very plastic; few very fine roots; few fine limestone and chert fragments of pebble size; strongly effervescent; common lime threads; diffuse, wavy boundary.

C1—23 to 35 inches, light-red (10R 6/6) clay, red (10R 5/6) moist; strong, medium and coarse, blocky structure; extremely hard, very firm, very sticky and very plastic; few very fine roots; strongly effervescent; common fine lime threads and few medium lime masses; gradual, wavy boundary.

C2—35 to 60 inches, light-red (10R 6/6) clay, red (10R 5/6) moist; massive; extremely hard, very firm, very sticky and very plastic; strongly effervescent.

Depth to calcareous material ranges from 5 to 10 inches. The soil between depths of 10 and 40 inches is 60 to 75 percent clay. The soil ranges from 0 to 10 percent coarse fragments of limestone and chert. Hue ranges from 5YR to 10R throughout. The A horizon is dark reddish brown, reddish brown, dusky red, and weak red. The B and C horizons are light red, light reddish brown, and pale red.

Tarrete silty clay loam, 8 to 15 percent slopes (Tb).—This strongly sloping soil is on hillsides and side slopes of ridges and in the heads of valleys. The areas are marked by a thick cover of cinquefoil and grasses. The soil has a profile similar to the one described as representative of the series, but a few relict, bluish-gray and greenish-gray mottles are below a depth of 30 inches.

Runoff is medium, and the hazard of erosion is moderate. This soil is used for range, pasture, recreation, watershed, and game range. Capability unit IVe–2 dryland; Clayey range site, 15- to 19-inch precipitation zone; windbreak suitability group 2M.

Terrace Escarpments

Two units of Terrace escarpments are mapped in this Area. They are described in the following paragraphs.

Terrace escarpments, gravelly (TCa).—This land type is on steep, eroded edges of gravelly terraces. Areas are irregularly shaped. Local relief ranges from 30 to 75 feet. Areas are 700 or 800 feet wide where short drainageways cut into the main body of the terrace. Beds of very gravelly sand and very gravelly loam, 5 to 25 feet thick, cover nearly all the land surface. Shale outcrop occurs in places on the lower parts of escarpments and deep drainageways. In most places slopes are stable, and a surface layer of grayish-brown gravelly loam or sandy loam 2 to 6 inches thick covers the loose sand and gravel.

Runoff is rapid, and the hazard of erosion is moderate. This land type is used for range, watershed, wildlife, and recreation. It is a source of gravel for road and masonry construction. Capability unit VIIs–1

dryland; Shallow to Gravel range site, 10- to 14-inch precipitation zone; windbreak suitability group 4.

Terrace escarpments, loamy (TCb).—This land type is on steep, eroded edges of fans, terraces, and foot slopes. Areas are 100 to 500 feet wide, and they typically separate soils on the main parts of the fans and terraces from soils on the flood plains. Where the valley bottoms are narrow, soils on the flood plains are included with this land type in mapping. Erosion is active. Slopes are short and uneven. Local relief is 15 to 30 feet. Slopes range from 8 to 50 percent and average 15 to 25 percent. The material ranges from clay loam to fine sandy loam and is commonly stratified.

Runoff is rapid, and the hazard of erosion is severe. This land type is used for range, wildlife, recreation, and watershed. Capability unit VIe–1 dryland; Thin Hilly range site, 10- to 14-inch precipitation zone; windbreak suitability group 4.

Terry Series

The Terry series consists of moderately deep, undulating, well-drained soils on ridges and hills in the sandstone uplands. Slopes are mostly 4 to 8 percent, but they range to 2 percent. These soils formed in material weathered in place from calcareous sandstone. Elevation ranges from 3,000 to 3,800 feet.

The native vegetation is mainly needleandthread, big sagebrush, western wheatgrass. Hoods phlox, and plains pricklypear. Annual precipitation is 13 to 14 inches, the average annual soil temperature is 47° to 49° F, and the frost-free period is 110 to 125 days.

In a representative profile the surface layer is brown sandy loam about 2 inches thick. The subsoil is brown sandy loam and sandy clay loam about 10 inches thick. The substratum is light yellowish-brown and pale-brown sandy loam. Sandstone is at a depth of about 25 inches.

Permeability is rapid, and available water capacity is low. The effective rooting depth is about 25 inches. These soils are used for range, wildlife, recreation, watershed, and dryfarmed crops.

Representative profile of Terry sandy loam, in an area of Terry-Travessilla sandy loams, undulating, in grassland, 1,320 feet north and 100 feet west of the SE. corner sec. 34, T. 8 S., R. 29 E.

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

B1—2 to 5 inches, brown (10YR 5/3) heavy sandy loam, dark brown (10YR 4/3) moist; weak, coarse, blocky structure; slightly hard, friable, nonsticky and slightly plastic; gradual, smooth boundary.

B2t—5 to 12 inches, brown (10YR 5/3) light sandy clay loam, dark brown (10YR 4/3) moist; weak, coarse, prismatic structure; hard, friable, slightly sticky and plastic; oriented clay films bridging sand grains; clear, smooth boundary.

C1ca—12 to 19 inches, light yellowish-brown (10YR 6/4) heavy sandy loam, dark brown (10YR 4/4) moist; weak, coarse, blocky structure; hard, friable, nonsticky and slightly plastic; flat sandstone fragments; strongly effervescent; gradual, wavy boundary.

C2—19 to 25 inches, pale-brown (10YR 6/3) sandy loam, brown (10YR 5/4) moist; massive; hard, friable, nonsticky and slightly plastic; 25 percent (volume) flat sandstone fragments; strongly effervescent; abrupt, wavy boundary.

R—25 inches, hard, variegated sandstone.

Depth to calcareous material ranges from 10 to 15 inches, and depth to bedrock, from 20 to 40 inches. The soil ranges from 0 to 25 percent coarse fragments throughout. Hue is 2.5Y or 10YR throughout. The A and B horizons range from 10 to 18 inches in combined thickness. The A horizon is brown and grayish brown. The B2t horizon is brown and dark-brown sandy loam and light sandy clay loam. The C horizon is light brownish gray, pale brown, and light yellowish brown.

Terry fine sandy loam, undulating (Td).—This undulating soil is on low ridges and in concave areas between broad drainage divides in the sandstone uplands. Slopes are mostly 4 to 8 percent, but they range to 2 percent. Local relief is 10 to 25 feet.

Included with this soil in mapping are areas of Nelson fine sandy loam and a few low sandstone ledges on the south sides of the ridges.

Runoff is medium, and the hazard of erosion is moderate. This soil is used for dryfarmed crops, pasture, wildlife, recreation, watershed, and range. Capability unit IVe–3 dryland; Sandy range site, 10- to 14-inch precipitation zone; windbreak suitability group 2M.

Terry-Travessilla sandy loams, undulating (TE).—This complex is made up of undulating soils on sandstone uplands that are dissected by shallow drainageways. It is about 45 percent Terry sandy loam, 35 percent Travessilla sandy loam and Travessilla channery sandy loam, and 15 percent Rock outcrop. Slopes are mostly 4 to 8 percent, but they range to 2 percent. The soils are intermixed, but the Travessilla soils are around areas of Rock outcrop and areas that have surface channers. The surface of Rock outcrop is typically 8 to 12 inches below the level of the surrounding soils. The Terry soil in this complex has the profile described as representative of the Terry series. Included in mapping are spots of soils that range to reddish brown and light reddish brown.

Runoff is slow, and the hazard of soil blowing is moderate. These soils are used for range, wildlife, recreation, and watershed. Capability unit VIs–1 dryland; Sandy range site, 10- to 14-inch precipitation zone; windbreak suitability group 3M.

Teton Series

The Teton series consists of moderately deep, strongly sloping to steep, well-drained soils on bedrock uplands and mountainsides. Slopes range from 8 to 45 percent. These soils formed in material weathered in place from sandstone. Elevation ranges from 4,000 to 5,500 feet.

The native vegetation is mainly big sagebrush, wild geranium, green needlegrass, Idaho fescue, and bluegrass. Annual precipitation is 20 to 22 inches, the average annual soil temperature is 43° to 45° F, and the frost-free period is 60 to 85 days.

In a representative profile the surface layer is very dark grayish-brown loam about 3 inches thick. The subsoil is dark grayish-brown and grayish-brown loam about 21 inches thick. The substratum is pale-brown

loam that contains scattered coarse sandstone fragments. Sandstone is at a depth of about 29 inches.

Permeabiliy is moderate, and available water capacity is low or moderate. The effective rooting depth is about 30 inches. These soils are used for range, recreation, watershed, and game range.

Representative profile of Teton loam, 8 to 25 percent slopes, in grassland, 1,200 feet south and 1,320 feet east of the NW. corner sec. 16, T. 6 S., R. 25 E.

A1—0 to 3 inches, very dark grayish-brown (10YR 3/2) loam, very dark brown (10YR 2/2) moist; weak, coarse, platy structure; soft, very friable, slightly sticky and slightly plastic; clear, smooth boundary.

B1—3 to 9 inches, dark grayish-brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; weak, medium, prismatic structure; slightly hard, friable, slightly sticky and slightly plastic; clear, wavy boundary.

B21—9 to 16 inches, dark grayish-brown (10YR 4/2) loam, dark brown (10YR 3/3) moist; weak, medium, prismatic structure parting to moderate, medium, blocky; hard, friable, sticky and plastic; clear, wavy boundary.

B3—16 to 24 inches, grayish-brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) moist; weak, medium, prismatic structure parting to moderate, medium, blocky; hard, friable, slightly sticky and plastic; clear, wavy boundary.

C—24 to 29 inches, pale-brown (10YR 6/3) loam, brown (10YR 4/3) moist; massive; hard, friable, slightly sticky and plastic; abrupt, wavy boundary.

R—29 to 33 inches, sandstone.

Depth to bedrock ranges from 20 to 40 inches. Hue is 10YR or 7.5YR throughout. The A and B horizons range from 0 to 15 percent coarse fragments, and the C horizon, from 10 to 35 percent. The dark-colored surface layer ranges from 9 to 16 inches in thickness. The A1 and B2 horizons are very dark grayish brown, dark grayish brown, and brown. The B horizon is heavy loam or light clay loam. The C horizon is moderately calcareous or noncalcareous.

Teton loam, 8 to 25 percent slopes (TFa).—This soil is on side slopes of canyons that are 150 to 250 feet deep. Low sandstone ledges crop out along the rims and on the lower side slopes. The soil has the profile described as representative of the series.

Included with this soil in mapping are areas of Rock outcrop, Splitro sandy loam, and Mayflower silty clay loam. These included soils make up 15 to 25 percent of the total area of this mapping unit.

Runoff is medium, and the hazard of erosion is moderate. This soil is used for range, wildlife, recreation, watershed, and pasture. Capability unit IVe–2 dryland; Silty range site, 20- to 24-inch precipitation zone; windbreak suitability group 2M.

Teton complex, 25 to 45 percent slopes (TFb).—This complex is made up of steep soils on the upper side slopes above the massive limestone rim of deep mountain canyons. It is about 40 percent Teton loam, 30 percent Mayflower silt loam, and 30 percent Duncom cobbly loam. The soils are in horizontal bands, but there is no predictable sequence in which they occur. The Teton soil in this complex has a profile similar to the one described as representative of the Teton series, but it is steeper.

Runoff is rapid, and the hazard of erosion is severe. These soils are used for range, recreation, watershed, and game range. Capability unit VIe–1 dryland; Silty range site, 20- to 24-inch precipitation zone; windbreak suitability group 4.

Thedalund Series

The Thedalund series consists of moderately deep, undulating to very steep, well-drained soils in the sedimentary uplands. Slopes range from 4 to 90 percent. These soils formed in material weathered in place from shale. Elevation ranges from 2,800 to 3,800 feet.

The native vegetation is mainly western wheatgrass, needleandthread, side-oats grama, dryland sedges, and big sagebrush. Annual precipitation is 12 to 14 inches, the average annual soil temperature is 48° to 50° F, and the frost-free period is 105 to 125 days.

In a representative profile the surface layer is grayish-brown loam about 2 inches thick. The underlying material is light olive-brown, light yellowish-brown, and light-gray loam. Loam shale is at a depth of about 28 inches.

Permeability is moderate, and available water capacity is low or moderate. The effective rooting depth is about 28 inches. Most of these soils are used for range, wildlife, recreation, and watershed. Small areas included with deeper soils are used for dryfarmed crops.

Representative profile of Thedalund loam, undulating, in grassland, 125 feet east of trail, 1,610 feet north and 1,400 feet east of the SW. corner sec. 14, T. 1 S., R. 35 E.

A—0 to 2 inches, grayish-brown (2.5Y 5/2) loam, dark grayish brown (2.5Y 4/2) moist; weak, coarse, granular structure; slightly hard, very friable, slightly sticky and slightly plastic; common very fine roots; slightly effervescent; clear, smooth boundary.

C1—2 to 8 inches, light olive-brown (2.5Y 5/4) heavy loam, olive brown (2.5Y 4/4) moist; weak, coarse, prismatic structure; hard, friable, slightly sticky and slightly plastic; common very fine roots; many very fine pores; slightly effervescent; few fine lime threads and soft lime masses; gradual, wavy boundary.

C2—8 to 14 inches, light yellowish-brown (2.5Y 6/4) heavy loam, olive brown (2.5YR 4/4) moist; weak, coarse, prismatic structure; hard, friable, slightly sticky and plastic; common very fine roots; common very fine pores; strongly effervescent; few fine, soft lime masses; gradual, wavy boundary.

C3—14 to 22 inches, light yellowish-brown (2.5Y 6/4) loam, light olive brown (2.5Y 5/4) moist; massive; slightly hard, friable, slightly sticky and plastic; few very fine roots; common very fine pores; strongly effervescent; common fine, soft lime masses; gradual, wavy boundary.

C4—22 to 28 inches, light-gray (5Y 7/2) loam, olive (5Y 5/3) moist; weak, thick, platy structure; slightly hard, friable, sticky and plastic; few very fine roots; common very fine pores; few shale and sandstone chips; strongly effervescent; common medium, soft lime masses; diffuse, smooth boundary.

C5—28 to 37 inches, platy loam shale.

Between depths of 10 and 40 inches the soil is loam or light clay loam. The soil normally ranges from 0 to 20 percent coarse fragments, but it is as much as 35 percent in the more stony phase. The A horizon and the upper part of the C horizon have hue of 2.5Y and 10YR, and the lower part of the C horizon, 2.5Y and 5Y. The A horizon is grayish brown, brown, and dark grayish brown. The lower part of the C horizon is light olive brown, light yellowish brown, and pale olive.

Thedalund loam, undulating (Tg).—This undulating soil is on narrow ridges and hills in mixed shale and sandstone highlands. Slopes are mostly 4 to 8 percent. The soil has the profile described as representative of the series. Included in mapping are areas of soils that have a surface layer of very fine sandy loam.

Runoff is medium, and the hazard of erosion is moderate. This soil is used for dryfarmed crops, hay, wildlife, recreation, watershed, and range. Capability unit IIIe–2 dryland; Silty range site, 10- to 14-inch precipitation zone; windbreak suitability group 2M.

Thedalund-Clapper complex, hilly (THa).—This complex is made up of hilly and steep soils in the gravelly sedimentary uplands. It is 40 to 70 percent Thedalund loam, 10 to 30 percent Clapper gravelly loam, 10 to 30 percent Midway silty clay loam, 5 to 15 percent Rock outcrop and Shale outcrop, and 5 to 10 percent McRae loam. Slopes are mostly 15 to 25 percent, but they range to 35 percent. The Thedalund and Midway soils are on ridges and valley sides where erosion has removed the gravelly capping. The Clapper soil is on terrace edges and on scattered knolls and ridges. The McRae soil is on the lower sides of the major valleys. Slopes are 20 to 35 percent on the Thedalund and McRae soils and 15 to 25 percent on the Clapper soil. The Clapper and Thedalund soils have profiles similar to the ones described as representative of their respective series, but they are steeper.

Runoff is rapid, and the hazard of erosion is severe. These soils are used for range, wildlife, recreation, and watershed. Capability unit VIe–1 dryland; Thin Hilly range site, 10- to 14-inch precipitation zone; windbreak suitability group 4.

Thedalund-Cushman loams, undulating (THb).—This complex is made up of undulating soils in the sedimentary uplands. It is about 60 percent Thedalund loam and 40 percent Cushman loam. The Thedalund soil is on ridges and hills where slopes are 6 to 8 percent. The Cushman soil is in concave areas between ridges and hills and on ridgetops where slopes are 4 or 5 percent. Included in mapping are areas of soils that have a light-brown substratum.

Runoff is medium, and the hazard of erosion is moderate. These soils are suited to dryfarmed crops, hay, wildlife, recreation, watershed, and range. Cultivation exposes the erodible, limy substratum of the Thedalund soil. Capability unit IIIe–3 dryland; Silty range site, 10- to 14-inch precipitation zone; windbreak suitability group 2M.

Thedalund-Fort Collins complex, rolling (THc).—This complex is made up of rolling soils in the sedimentary uplands. It is 25 to 40 percent Thedalund loam, 15 to 25 percent Midway silty clay loam, and 35 to 50 percent Fort Collins loam, Thurlow silty clay loam, and McRae loam. Slopes are 8 to 15 percent. The Thedalund and Midway soils are on the crests and sides of hills and ridges. The Fort Collins, Thurlow, and McRae soils are in valleys and tributary drainageways. Slopes range from 175 to 300 feet long. The Thedalund, Midway, and Fort Collins soils in this complex have profiles similar to the ones described as representative of their respective series, but the Thedalund and Fort Collins soils are steeper, and the Midway soil is less sloping. Included in mapping are isolated, 5- to 15-acre knolls of Nelson and Travessilla sandy loams.

Runoff is medium, and the hazard of erosion is moderate. These soils are suited to wildlife, range, hay, and pasture. Capability unit IVe–3 dryland; Silty range site, 10- to 14-inch precipitation zone; windbreak suitability group 2M.

Thedalund-McRae loams, dissected (THd).—This complex is made up of undulating to steep soils in the sedimentary uplands. It is 40 to 65 percent Thedalund loam, 30 to 50 percent McRae loam, and 5 to 15 percent Kim loam. Slopes are 4 to 35 percent. The Thedalund soil is in 2- to 10-acre patches on shale knolls and ridges where slopes are 8 to 25 percent. The McRae soil is on fans and foot slopes that surround or lie between patches of the Thedalund soil. The Kim soil is on the sides and edges of narrow gullies and coulees that are 5 to 15 feet deep. It has slopes of 20 to 35 percent. The Thedalund and McRae soils in this complex have profiles similar to the ones described as representative of their respective series, but they are steeper.

Runoff is rapid, and the hazard of erosion is severe. Most areas receive runoff from soils above them. These soils are suited to range, wildlife, recreation, watershed, and pasture. Capability unit IVe–3 dryland; Silty range site, 10- to 14-inch precipitation zone; windbreak suitability group 2M.

Thedalund-Midway complex, rolling (THe).—This complex is made up of rolling soils in the sedimentary uplands. It is 40 to 70 percent Thedalund loam, 20 to 40 percent Midway silty clay loam, and 10 to 20 percent McRae loam. Slopes are 8 to 15 percent. The Thedalund and Midway soils are intermixed on hills and ridges. The McRae soil is in the shallow heads of drainageways and on narrow foot slopes in wide drainageways. The Thedalund and Midway soils in this complex have profiles similar to the ones described as representative of their respective series, but the Thedalund soil is steeper and the Midway soil is less sloping.

Runoff is medium, and the hazard of erosion is moderate. These soils are suited to range, wildlife, recreation, watershed, and pasture. Capability unit IVe–3 dryland; Silty range site, 10- to 14-inch precipitation zone; windbreak suitability group 3M.

Thedalund-Nelson complex, rolling (THf).—This complex is made up of rolling soils in the sedimentary uplands. It is 40 to 60 percent Thedalund loam, 20 to 35 percent Nelson fine sandy loam, and 10 to 30 percent Glenberg, Alice, and Fort Collins soils. Slopes are 8 to 15 percent. The Thedalund and Nelson soils are intermixed. The Alice, Fort Collins, and Glenberg soils are at the heads and in the bottoms of the main drainageways or on foot slopes below high ridges. The Thedalund and Nelson soils in this complex have profiles similar to the ones described as representative of their respective series, but they are steeper.

Runoff is medium, and the hazard of erosion is moderate. These soils are suited to range, wildlife, recreation, watershed, and pasture. Capability unit IVe–3 dryland; Silty range site, 10- to 14-inch precipitation zone; windbreak suitability group 2M.

Thedalund-Rock outcrop complex, hilly (THg).—This complex is made up of hilly and steep soils in the

sedimentary uplands. It is 40 to 70 percent Thedalund loam, 10 to 30 percent Midway silty clay loam, 10 to 20 percent Rock outcrop and Shale outcrop, and 5 to 15 percent McRae loam. Slopes are mostly 15 to 25 percent, but they range to 35 percent. The Thedalund and Midway soils are intermixed, but the Midway soil is generally around areas of Shale outcrop and has slopes of 25 to 35 percent. The McRae soil is in 1- to 5-acre patches in wide valleys. The Thedalund and Midway soils in this complex have profiles similar to the ones described as representative of their respective series, but they are steeper.

Runoff is rapid, and the hazard of erosion is severe. Runoff waters carry a moderate amount of sediment. These soils are suited to range, recreation, watershed, and game range. The timbered areas are mainly in deep, narrow valleys and on north-facing hillsides. The principal tree species are ponderosa pine and Rocky Mountain juniper. The average site index for the ponderosa pine is about 65.

The stands are generally open, and only isolated areas are overstocked. Timber harvest is limited to scattered overstocked areas. Most areas are accessible for logging and control of fire. Capability unit VIe–1 dryland; Thin Hilly range site, 10- to 14-inch precipitation zone; windbreak suitability group 4.

Thedalund-Rock outcrop complex, very steep (THh).—This complex is made up of steep and very steep soils in the sedimentary uplands. It is about 35 percent Thedalund loam, 30 percent Rock outcrop and Shale outcrop, and 35 percent Midway silty loam. Slopes are 35 to 90 percent. The Thedalund and Midway soils are intermixed. Rock outcrop is on the rims and very steep sides of hills, valleys, and escarpments where slopes are 65 to 90 percent. The Thedalund and Midway soils in this complex have profiles similar to the ones described as representative of their respective series, but they are steeper.

Runoff is rapid, and the hazard of erosion is severe. Runoff waters carry a high amount of sediment. These soils are suited to range, recreation, watershed, and game range. Capability unit VIIe–1 dryland; Thin Breaks range site, 10- to 14-inch precipitation zone; windbreak suitability group 4.

Thedalund-Travessilla loams, rolling (THk).—This complex is made up of undulating and rolling soils in the sedimentary uplands. It is about 40 percent Thedalund loam, 25 percent Travessilla loam, 20 percent Cushman loam, and 15 percent Hydro loam. Slopes are mostly 8 to 15 percent, but they range to 2 percent. The Thedalund and Travessilla soils are on narrow ridges, on the crests of surface undulations, and along the valley rim. Some areas of Rock outcrop mark the Travessilla soil. The Cushman soil is on side slopes of ridges and hills and in drainageways. The Hydro soil is in swales and troughs of surface undulations where runoff water collects. Included in mapping are ½- to 2-acre patches of Midway silty clay loam and Nelson sandy loam.

Runoff is medium, and the hazard of erosion is moderate. These soils are suited to range, wildlife, recreation, and watershed. Capability unit VIs–1 dryland; Silty range site, 10- to 14-inch precipitation zone; windbreak suitability group 3M.

Thedalund-Wibaux loams, undulating (THl).—This complex is made up of undulating soils in the sedimentary uplands. It is about 45 percent Thedalund loam, 40 percent Wibaux loam, and 15 percent Travessilla loam, Spearman loam, and Hydro loam. Slopes are 4 to 8 percent. The Thedalund and Wibaux soils occur in a random pattern in all mapped areas. This complex is in patches less than 40 acres in size. The Wibaux soil is red. The Hydro soil is in troughs between low ridges.

Runoff is medium, and the hazard of erosion is moderate. These soils are suited to range, wildlife, recreation, and watershed. Capability unit VIs–1 dryland; Silty range site, 10- to 14-inch precipitation zone; windbreak suitability group 3M.

Thedalund-Wibaux complex, rolling (THm).—This complex is made up of rolling soils in the sedimentary uplands. It is 55 to 70 percent Thedalund loam, 20 to 35 percent Wibaux channery loam, and 5 to 15 percent McRae loam. Slopes are 8 to 15 percent. The Thedalund and Wibaux soils occur in a random pattern, but the Wibaux soil has outcrops of red shale and surface fragments of channer size. The McRae soil is in the main drainageways.

Runoff is medium, and the hazard of erosion is moderate. These soils are suited to range, wildlife, recreation, and watershed. Capability unit VIe–1 dryland; Silty range site, 10- to 14-inch precipitation zone; windbreak suitability group 3M.

Thedalund-Wibaux stony loams, hilly (THn).—This complex is made up of hilly and steep soils in the sedimentary uplands. It is 45 to 60 percent Thedalund stony loam, 25 to 35 percent Wibaux stony loam, and 10 to 20 percent Shale outcrop. Minor soils in some valleys make up 5 to 10 percent of the complex. The Thedalund and Wibaux soils occur in a random pattern, but the Wibaux soil is distinguished by its red color. The Thedalund and Wibaux soils in this complex have profiles similar to the ones described as representative of their respective series, but they are steeper, and they are stony.

Runoff is rapid, and the hazard of erosion is severe. These soils are suited to range, recreation, watershed, and game range. Capability unit VIe–1 dryland; Thin Hilly range site, 10- to 14-inch precipitation zone; windbreak suitability group 4.

Thedalund-Wibaux complex, very steep (THo).—This complex is made up of steep and very steep soils in the sedimentary uplands. It is 40 to 50 percent Thedalund stony loam, 30 to 35 percent Wibaux very stony loam, and 20 to 30 percent Rock outcrop. Slopes are 35 to 90 percent. The soils occur in a random pattern, but the Wibaux soil is distinguished by its red color and its very stony surface. The Thedalund and Wibaux soils in this complex have profiles similar to the ones described as representative of their respective series, but they are steeper; the Thedalund soil has fragments of channer and stone size covering 10 to 20 percent of the surface; and the Wibaux soil has a very stony surface layer.

Runoff is rapid, and the hazard of erosion is severe. These soils are suited to range, recreation, watershed, and game range. Capability unit VIIe–1 dryland; Thin

Breaks range site, 10- to 14-inch precipitation zone; windbreak suitability group 4.

Thurlow Series

The Thurlow series consists of deep, nearly level to gently sloping and rolling, well-drained soils on fans, terraces, and foot slopes. Slopes range from 0 to 15 percent. These soils formed in calcareous alluvium derived from mixed shale and sandstone rock. Elevation ranges from 2,800 to 3,600 feet.

The native vegetation is mainly western wheatgrass, blue grama, green needlegrass, and big sagebrush. Annual precipitation is 12 to 14 inches, the average annual soil temperature is 48° to 50° F, and the frost-free period is 110 to 125 days.

In a representative profile the surface layer is dark grayish-brown silt loam about 2 inches thick. The subsoil is grayish-brown, light olive-brown, and pale-olive heavy silty clay loam and silty clay about 18 inches thick. The substratum is light olive-gray silty clay loam and silt loam that extends to a depth of 61 inches or more.

Permeability is moderately slow, and available water capacity is high. The effective rooting depth is 60 inches or more. These soils are used for irrigated and dryfarmed crops, watershed, wildlife, recreation, and range.

Representative profile of Thurlow silty clay loam, 4 to 8 percent slopes, in grassland, 1,000 feet west and 100 feet north of the center of sec. 34, T. 1 N., R. 35 E.

A1—0 to 2 inches, dark grayish-brown (2.5Y 4/2) silt loam, very dark grayish brown (2.5Y 3/2) moist; weak, very thin, platy structure; soft, very friable, slightly sticky and slightly plastic; many micro and fine roots; clear, smooth boundary.

B1—2 to 4 inches, grayish-brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; weak, medium, prismatic structure; hard, firm, sticky and plastic; common micro and very fine roots; common fine pores; clear, smooth boundary.

B21t—4 to 9 inches, light olive-brown (2.5Y 5/4) silty clay, dark grayish brown (2.5Y 4/2) moist; strong, medium, prismatic structure parting to moderate, medium, blocky; very hard, firm, very sticky and very plastic; common fine and micro roots; common fine and micro pores; moderately thick, patchy clay films on peds; clear, smooth boundary.

B22t—9 to 13 inches, light olive-brown (2.5Y 5/4) heavy silty clay loam olive brown (2.5Y 4/4) moist; strong, medium, prismatic structure parting to moderate, medium, blocky; very hard, firm, very sticky and very plastic; common very fine roots; many micro and fine pores; thin, patchy clay films on peds; clear, wavy boundary.

B3—13 to 20 inches, pale-olive (5Y 6/3) heavy silty clay loam, olive (5Y 5/3) moist; moderate, coarse, prismatic structure parting to moderate, coarse and medium, blocky; very hard, firm, very sticky and very plastic; common very fine roots; many very fine and micro pores; slightly effervescent; gradual, wavy boundary.

C1ca—20 to 26 inches, light olive-gray (5Y 6/2) silty clay loam, olive (5Y 5/3) moist; moderate, coarse, blocky structure; very hard, firm, sticky and plastic; few very fine roots; many very fine and micro pores; strongly effervescent; common distinct, soft lime masses; gradual, wavy boundary.

C2—26 to 38 inches, light olive-gray (5Y 6/2) silty clay loam, olive (5Y 5/3) moist; weak, medium, blocky structure; very hard, friable, sticky and plastic; few very fine roots; common fine pores; strongly effervescent; few fine lime threads and soft lime masses; gradual, wavy boundary.

C3—38 to 49 inches, light olive-gray (5Y 6/2) light silty clay loam, olive (5Y 5/3) moist; massive; hard, friable, sticky and plastic; strongly effervescent; few medium and fine, soft lime masses; diffuse, wavy boundary.

C4—49 to 61 inches, light olive-gray (5Y 6/2) heavy silt loam, olive (5Y 5/3) moist; massive; hard, slightly sticky and plastic; strongly effervescent.

The noncalcareous part of the solum ranges from 10 to 16 inches in thickness. Hue is 10YR or 2.5Y throughout. The A1 horizon is silt loam or loam. The Ap horizon ranges from dark grayish-brown and grayish-brown to light brownish-gray silty clay loam or clay loam. The B2t horizon ranges from 35 to 45 percent clay and is grayish brown, light yellowish brown, and brown. The Cca horizon is light gray, pale yellow, light olive gray, and pale olive.

Thurlow silty clay loam, 0 to 1 percent slopes (Tk).—This nearly level soil is on terraces and fans. Areas range from 5 to 40 acres in size. The soil has a profile similar to the one described as representative of the series, but it is less sloping. Included in mapping are 1- to 2-acre areas of Hydro loam and Allentine clay.

Runoff is slow, and the hazard of erosion is slight. This soil is suited to irrigated and dryfarmed crops, hay, wildlife, recreation, watershed, and range. Capability unit IIIc–1 dryland, IIc–2 irrigated; Clayey range site, 10- to 14-inch precipitation zone; windbreak suitability group 1.

Thurlow silty clay loam, 1 to 4 percent slopes (Tm).—This soil is on nearly level fans and terraces. Slopes are mostly 1 to 2 percent on the terraces and 3 to 4 percent on the fans. The soil has a profile similar to the one described as representative of the series, but it is less sloping.

Runoff is slow, and the hazard of erosion is slight. This soil is suited to irrigated and dryfarmed crops, hay, watershed, wildlife, recreation, and range. Capability unit IIIe–3 dryland, IIe–1 irrigated; Clayey range site, 10- to 14-inch precipitation zone; windbreak suitability group 1.

Thurlow silty clay loam, 4 to 8 percent slopes (Tn).—This soil is on foot slopes and fans. Slopes range from 200 to 600 feet long. The soil has the profile described as representative of the series.

Included with this soil in mapping are areas of Heldt silty clay loam and Midway silty clay loam. These included soils make up 15 to 20 percent of the total area of this mapping unit.

Runoff is medium, and the hazard of erosion is moderate. This soil is suited to irrigated and dryfarmed crops, watershed, wildlife, recreation, hay, and range. Capability unit IIIe–3 dryland, IIIe–1 irrigated; Clayey range site, 10- to 14-inch precipitation zone; windbreak suitability group 1.

Thurlow-Midway silty clay loams, 4 to 15 percent slopes (To).—This complex is made up of gently sloping and strongly sloping soils on fans, foot slopes, low knolls, and short ridges. Areas typically include an entire valley below the steeply rising hills and ridges on its border. The complex is 50 percent Thurlow silty clay loam, 40 percent Midway silty clay loam, and 10 percent Lohmiller silty clay loam. The Thurlow soil is in small areas on foot slopes and fans that are dissected by narrow drainageways. The Midway soil is

on knolls and short ridges and is scattered throughout areas of the Thurlow soil. The Midway soil has slopes of 12 to 15 percent. The Lohmiller soil is below areas of Shale outcrop in a narrow band along dry stream channels. Included in mapping are areas of Thedalund loam and outcrops of sandstone near the Midway soils.

Runoff is medium, and the hazard of erosion is moderate. The Thurlow soil receives runoff from soils on valley sides. These soils are suited to range, wildlife, recreation, watershed, and pasture. Capability unit IVe–3 dryland; Clayey range site, 10- to 14-inch precipitation zone; windbreak suitability group 1.

Toluca Series

The Toluca series consists of deep, undulating, well-drained soils on high terraces and fans in the sedimentary uplands. Slopes are mostly 4 to 8 percent, but they range to 2 percent. These soils formed in calcareous loam alluvium from eroding terraces and weathering shale and sandstone. Elevation ranges from 2,800 to 3,600 feet.

The native vegetation is mainly green needlegrass, fringed sagewort, needleandthread, and big sagebrush. Annual precipitation is 12 to 14 inches, the average annual soil temperature is 48° to 50° F, and the frost-free period is 115 to 125 days.

In a representative profile the surface layer is grayish-brown and dark grayish-brown loam about 3 inches thick. The subsoil is brown and light olive-brown clay loam about 8 inches thick. The substratum is pale-yellow loam and fine sandy loam. Unconformable very gravelly sand is at a depth of about 41 inches.

Permeability and available water capacity are moderate. The effective rooting depth is 60 inches or more. These soils are used for dryfarmed crops, wildlife, recreation, watershed, and range. They are suitable for irrigation.

Representative profile of Toluca loam, in an area of Toluca-Harvey complex, undulating, in grassland, 75 feet east of trail, 1,880 feet east and 525 feet north of the SW. corner sec. 1, T. 1 N., R. 31 E.

A—0 to 1 inch, grayish-brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) moist; weak, medium, platy structure; soft, friable, nonsticky and slightly plastic; abrupt, smooth boundary.

AB—1 inch to 3 inches, dark grayish-brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; weak, medium, prismatic structure parting to weak, medium, platy; slightly hard, friable, slightly sticky and slightly plastic; clear boundary.

B2t—3 to 8 inches, brown (10YR 5/3 crushed, 4/2 coated) clay loam, dark brown (10YR 4/3 crushed, 3/3 coated) moist; moderate, medium, prismatic structure parting to moderate, medium, blocky; hard, friable, very sticky and plastic; clear boundary.

B3—8 to 11 inches, light olive-brown (2.5Y 5/4) clay loam, olive brown (2.5Y 4/4) moist; hard, friable, sticky and plastic; clear, wavy boundary.

C1ca—11 to 17 inches, pale-yellow (2.5Y 7/4) loam, light olive brown (2.5Y 5/4) moist; weak, medium, prismatic structure; hard, friable, sticky and plastic; strongly effervescent; flour lime throughout; gradual, wavy boundary.

C2—17 to 41 inches, pale-yellow (2.5Y 7/4) fine sandy loam, light olive brown (2.5Y 5/4) moist; massive; slightly hard, friable, nonsticky and slightly plastic; strongly effervescent; clear, wavy boundary.

IIC—41 to 60 inches, very gravelly sand and small pockets of sandy loam.

Depth to calcareous material ranges from 7 to 9 inches. The upper part of the soil ranges from 0 to 15 percent coarse fragments but normally is less than 5 percent. The Ap horizon is grayish brown and light brownish gray in hue of 10YR or 2.5Y. The B2t horizon is brown, grayish brown, and light olive brown. It ranges from 30 to 35 percent clay. The Cca horizon is very pale brown, light gray, and pale yellow. The unconformable IIC horizon is more than 50 percent fragments of pebble size.

Toluca-Harvey complex, undulating (Tp).—This complex is made up of undulating soils on dissected high terraces. It is about 60 percent Toluca loam and 40 percent Harvey gravelly loam. Slopes are mostly 4 to 8 percent, but they range to 2 percent. Shallow drainageways make local relief of 5 to 20 feet. The Toluca soil is between drainageways on small, smooth areas where slopes are 2 to 4 percent. The Harvey soil is along drainageways and on narrow ridges and has fragments of pebble size on the surface. The Harvey soil in this complex has a profile similar to the one described as representative of the Harvey series, but the surface layer is gravelly loam.

Runoff is medium, and the hazard of erosion is moderate. These soils are suited to dryfarmed crops, hay, wildlife, recreation, watershed, and range. Capability unit IIIe–3 dryland; Clayey range site, 10- to 14-inch precipitation zone; windbreak suitability group 2L.

Travessilla Series

The Travessilla series consists of shallow, undulating and rolling, well-drained soils on hills and ridges in the sandstone uplands. Slopes are mostly 4 to 15 percent, but they range to 2 percent. The soils formed in material weathered in place from calcareous, hard sandstone. Elevation ranges from 3,200 to 3,800 feet.

The native vegetation is mainly prairie sandreed, Indian ricegrass, skunkbush sumac, and blue grama. Annual precipitation is 12 to 14 inches, the average annual soil temperature is 50° to 55° F, and the frost-free period is 115 to 120 days.

In a representative profile the surface layer is grayish-brown sandy loam about 2 inches thick. The underlying material is pale-brown sandy loam and channery sandy loam. Hard sandstone is at a depth of about 18 inches.

Permeability is rapid, and available water capacity is very low. The effective rooting depth is about 18 inches. These soils are used for range, recreation, wildlife, and watershed.

Representative profile of Travessilla sandy loam, in an area of Travessilla-Thedalund loams, rolling, in grassland, 300 feet north and 300 feet east of the SW. corner sec. 33, T. 4 S., R. 29 E.

A—0 to 2 inches, grayish-brown (10YR 5/2) sandy loam, dark grayish brown (10YR 4/2) moist; weak, fine, granular structure; soft, very friable, nonsticky and nonplastic; clear, smooth boundary.

C1—2 to 13 inches, pale-brown (10YR 6/3) sandy loam, brown (10YR 5/3) moist; weak, thick, platy structure; soft, very friable, nonsticky and slightly plastic; strongly effervescent; gradual, wavy boundary.

C2—13 to 18 inches, pale-brown (10YR 6/3) channery sandy loam, brown (10YR 5/3) moist; massive; soft, very

friable, nonsticky and nonplastic; 35 percent partly weathered, horizontally oriented, ¼-inch sandstone fragments of channer size; strongly calcareous; abrupt, wavy boundary.

R—18 to 20 inches, hard, calcareous sandstone.

Depth to bedrock ranges from 6 to 20 inches. The soil ranges from 10 to 35 percent coarse fragments of stone, channer, and gravel size. Typically, there is no accumulated calcium carbonate in the soil, but the upper part of the bedrock in places has thin lime casts on the bottoms of the coarse fragments. The soil is brown, light brown, pale brown, and light yellowish brown in hue of 2.5Y to 7.5Y throughout. The A horizon is loam, channery loam, or sandy loam.

Travessilla-Rock outcrop complex, rolling (TR).—This complex is made up of undulating and rolling soils on hills and ridges in the sedimentary uplands. It is about 70 percent Travessilla channery loam and 30 percent Rock outcrop. Slopes are mostly 8 to 15 percent, but they range to 4 percent. The soils are intermixed, but 25 to 50 percent of the surface of the Travessilla soil is covered with 3- to 8-inch, hard sandy shale fragments of channer size. Rock outcrop is level with the land surface. The Travessilla soil in this complex has a profile similar to the one described as representative of the Travessilla series, but the surface layer is loam 3 to 5 inches thick. Included in mapping are areas of Lavina loam in the concave heads of drainageways and in troughs between low ridges.

Runoff is medium, and the hazard of erosion is moderate. These soils are suited to range, wildlife, recreation, and watershed. Capability unit VIs–1 dryland; Shallow range site, 10- to 14-inch precipitation zone; windbreak suitability group 4.

Travessilla-Thedalund loams, rolling (TS).—This complex is made up of rolling soils on hills and ridges in the sedimentary uplands. It is about 40 percent Travessilla loam and sandy loam, 40 percent Thedalund loam, and 15 percent Rock outcrop. Slopes are 8 to 15 percent. The soils are intermixed, but the Thedalund soil is typically on low ridges and hills and has slopes of 8 to 15 percent. The Travessilla soil is between ridges where erosion has exposed the sandstone and sandy shale. It has slopes of 2 to 10 percent. Rock outcrop is level with the soil surface and also occurs as ledges. The Thedalund soil in this complex has a profile similar to the one described as representative of the Thedalund series, but it is steeper. The Travessilla sandy loam has the profile described as representative of the Travessilla series.

Runoff is medium, and the hazard of erosion is moderate. These soils are suited to range, wildlife, recreation, and watershed. Capability unit VIe–1 dryland; Silty range site, 10- to 14-inch precipitation zone; windbreak suitability group 3M.

Trulon Series

The Trulon series consists of moderately deep, rolling, well-drained soils on hills and ridges in the sedimentary uplands. Slopes are mostly 8 to 15 percent, but they range to 4 percent. These soils formed in place in material weathered from calcareous loam shale and limestone. Elevation ranges from 3,900 to 4,700 feet.

The native vegetation is mainly bluebunch wheatgrass, prairie junegrass, western wheatgrass, and Idaho fescue. Annual precipitation is 14 to 16 inches, the average annual soil temperature is 45° to 46° F, and the frost-free period is 95 to 105 days.

In a representative profile the surface layer is grayish-brown and brown loam about 7 inches thick. The underlying material is pale-brown, very pale brown, and pink loam and channery. Limestone is at a depth of about 30 inches.

Permeability is moderately slow, and available water capacity is low. The effective rooting depth is about 30 inches. The soils are used for range, wildlife, recreation, and watershed.

Representative profile of Trulon loam, in an area of Lap-Trulon complex, rolling, in a cultivated area, 1,300 feet south and 200 feet east of the NW. corner sec. 18, T. 6 S., R. 31 E.

Ap—0 to 3 inches, grayish-brown (10YR 5/2) loam, dark brown (10YR 3/3) moist; weak, medium, platy structure; slightly hard, friable, sticky and slightly plastic; very slightly effervescent; clear, smooth boundary.

A12—3 to 7 inches, brown (10YR 5/3) loam, dark brown (10YR 3/3) moist; weak, medium, prismatic structure; hard, friable, slightly sticky and slightly plastic; slightly effervescent; wavy boundary.

C1—7 to 9 inches, pale-brown (10YR 6/3) loam, brown (10YR 5/3) moist; moderate, coarse, prismatic structure; hard, friable, slightly sticky and slightly plastic; about 10 percent limestone fragments; violently effervescent; common soft segregated lime masses; gradual boundary.

C2ca—9 to 15 inches, very pale brown (10YR 7/3) loam, pale brown (10YR 6/3) moist; weak, coarse, prismatic structure; hard, friable, slightly sticky and slightly plastic; few limestone fragments; violently effervescent; lime flour and common medium lime masses; clear, wavy boundary.

C3—15 to 30 inches, pink (7.5YR 8/3) channery loam, pink (7.5YR 7/3) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; 20 percent limestone fragments of channer size; violently effervescent; thick lime coatings on fragments; abrupt, irregular boundary.

R—30 inches, hard limestone.

Depth to bedrock ranges from 20 to 40 inches. The soil ranges from 15 to 35 percent coarse fragments of limestone. Below a depth of 10 inches and above bedrock, the soil is loam, or silty clay loam. The A horizon has hue of 10YR or 2.5Y. The Cca and C3 horizons range from pinkish white to pale yellow in hue of 2.5Y to 7.5YR.

Trulon soils in the Big Horn County Area are mapped only with Lap soils.

Tullock Series

The Tullock series consists of moderately deep, rolling, well-drained soils on hills and ridges in the sedimentary uplands. Slopes are mostly 8 to 15 percent, but they range to 4 percent. These soils formed in material weathered in place from calcareous, weakly cemented sandstone. Elevation ranges from 3,200 to 3,600 feet.

The native vegetation is mainly sand bluestem, little bluestem, prairie sandreed, needleandthread, and annual eriogonum. Annual precipitation is 13 to 14 inches, the average annual soil temperature is 49° to 50° F, and the frost-free period is 110 to 120 days.

In a representative profile the surface layer is grayish-brown loamy fine sand about 2 inches thick. The underlying material is grayish-brown, light yellowish-brown, and light-gray loamy fine sand and loamy sand. Weakly cemented sandstone is at a depth of about 38 inches.

Permeability is rapid, and available water capacity is very low or low. The effective rooting depth is about 40 inches. These soils are used for range, wildlife, recreation, and watershed.

Representative profile of Tullock loamy fine sand, rolling, in grassland, 600 feet north and 100 feet east of the SW. corner sec. 36, T. 1 N., R. 34 E.

A—0 to 2 inches, grayish-brown (2.5Y 5/2) heavy loamy fine sand, dark grayish brown (2.5Y 4/2) moist; single grained; loose (dry and moist), nonsticky and nonplastic; common fine roots; clear, smooth boundary.

C1—2 to 7 inches, grayish-brown (2.5Y 5/2) loamy fine sand, dark grayish brown (2.5Y 4/2) moist; weak, coarse, prismatic structure; slightly hard, very friable, nonsticky and nonplastic; common fine roots; gradual, wavy boundary.

C2—7 to 17 inches, light yellowish-brown (2.5Y 6/4) loamy sand, light olive brown (2.5Y 5/4) moist; weak, coarse, prismatic structure; soft, very friable, nonsticky and nonplastic; common very fine and micro roots; very slightly effervescent; gradual, wavy boundary.

C3—17 to 33 inches, light yellowish-brown (2.5Y 6/4) loamy sand, light olive brown (2.5Y 5/4) moist; massive; hard, very friable, nonsticky and slightly plastic; few fine roots; slightly effervescent; diffuse boundary.

C4—33 to 38 inches, light-gray (2.5Y 7/2) loamy sand, grayish brown (2.5Y 5/2) moist; massive; hard, friable, slightly sticky and slightly plastic; few fine roots; strongly effervescent; diffuse, wavy boundary.

C5—38 to 46 inches, pale-yellow (2.5Y 7/4) sandstone.

Depth to weakly consolidated sandstone bedrock ranges from 20 to 40 inches. The A horizon is grayish brown and light yellowish brown. The C horizon is grayish brown, light yellowish brown, light gray, and pale yellow.

Tullock loamy fine sand, rolling (Tu).—This soil is on valley rims, hills, and ridges in the sedimentary uplands. Slopes are mostly 8 to 15 percent, but they range to 4 percent. Areas range from 30 to 125 acres in size and are scattered throughout sandstone highlands. There is evidence of soil blowing on the east and southeast sides of Rock outcrop, and there are a few blowouts as much as ½ acre in size. Local relief ranges from 20 to 75 feet. Slopes are short and as much as 150 feet long.

Included with this soil in mapping are areas of Rock outcrop, Travessilla loamy fine sand, and Glenberg fine sandy loam. The Glenberg soil is below sandstone ledges. The Travessilla soil is above rock ledges and adjacent to the ground-level Rock outcrop. These included soils make up about 25 percent of the total area of this mapping unit. Also included are areas of soils that have sandstone at a depth of more than 40 inches.

Runoff is slow, and the hazard of erosion is severe. This soil is suited to range, wildlife, recreation, and watershed. Capability unit VIe–1 dryland; Sands range site, 10- to 14-inch precipitation zone; windbreak suitability group 3M.

Twin Creek Series

The Twin Creek series consists of deep, gently sloping to strongly sloping, well-drained soils on fans, terraces, and foot slopes. Slopes range from 2 to 15 percent. These soils formed in red loam and silt loam alluvium washed from fine-grained sandstone and shale. Elevation ranges from 3,700 to 4,800 feet.

The native vegetation is mainly Sandberg bluegrass, snowberry, prairie junegrass, and Idaho fescue. Annual precipitation is 15 to 17 inches, the average annual soil temperature is 45° to 46° F, and the frost-free period is 95 to 110 days.

In a representative profile the surface layer is reddish-brown loam about 3 inches thick. The subsoil is reddish-brown loam about 15 inches thick. The substratum is red and light-red loam that extends to a depth of 65 inches or more.

Permeability is moderate, and available water capacity is high. The effective rooting depth is 60 inches or more. These soils are used for range, wildlife, recreation, watershed, and irrigated and dryfarmed crops.

Representative profile of Twin Creek loam, 4 to 8 percent slopes, in grassland, 1,000 feet south and 50 feet west of the NE. corner sec. 23, T. 5 S., R. 27 E.

A1—0 to 3 inches, reddish-brown (5YR 4/4) loam, dark reddish brown (5YR 3/3) moist; moderate, medium, platy structure; slightly hard, friable, nonsticky and slightly plastic; common very fine roots; clear, smooth boundary.

B21—3 to 11 inches, reddish-brown (5YR 4/4) heavy loam, dark reddish brown (5YR 3/3) moist; weak, medium, prismatic structure parting to moderate, medium, blocky; hard, friable, slightly sticky and slightly plastic; common very fine roots; common very fine pores; gradual, wavy boundary.

B22—11 to 18 inches, reddish-brown (5YR 5/4) heavy loam, reddish brown (5YR 4/4) moist; moderate, medium, prismatic structure parting to moderate, medium, blocky; hard, friable, slightly sticky and slightly plastic; few very fine roots; common very fine pores; gradual, wavy boundary.

C1—18 to 26 inches, red (2.5YR 5/6) loam, reddish brown (2.5YR 4/4) moist; moderate, coarse, blocky structure; hard, friable, slightly sticky and slightly plastic; few very fine roots; common very fine pores; slightly effervescent; few very fine lime threads; clear, wavy boundary.

C2ca—26 to 39 inches, red (2.5Y 5/6) loam, red (2.5Y 4/6) moist; weak, fine, subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few very fine roots; common very fine pores strongly effervescent; common fine lime threads; diffuse, wavy boundary.

C3—39 to 65 inches, light-red (2.5YR 6/6) loam, red (2.5YR 4/6) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; 15 percent (volume) fine shale chips; slightly effervescent.

Depth to calcareous material ranges from 12 to 20 inches. The soil between depths of 10 and 40 inches is loam, but in places it is stratified with silt loam or clay loam. Below a depth of 30 inches the soil ranges from 0 to 15 percent coarse fragments. The A1 and B2 horizons are reddish brown, reddish gray, and weak red in hue of 2.5YR or 5YR. The C horizon is red, light red, and light reddish brown in hue of 2.5YR or 10R.

Twin Creek loam, 2 to 4 percent slopes (Tv).—This soil is on fans and terraces in the red shale highlands. Areas range from 15 to 25 acres in size. Slopes range from 200 to 450 feet long. The soil has a profile similar to the one described as representative of the series,

but it is less sloping. Included in mapping are areas of soils that have a surface layer of silt loam or very fine sandy loam.

Runoff is slow, and the hazard of erosion is moderate. This soil is suited to irrigated and dryfarmed crops, hay, watershed, wildlife, recreation, and range. Capability unit IIe–2 dryland, IIe–1 irrigated; Silty range site, 15- to 19-inch precipitation zone; windbreak suitability group 1.

Twin Creek loam, 4 to 8 percent slopes (Tw).—This soil is in narrow areas on fans and foot slopes in the shale highlands. It has the profile described as representative of the series.

Runoff is medium, and the hazard of erosion is moderate. Most areas receive runoff from soils above them. This soil is suited to dryfarmed crops, hay, wildlife, recreation, watershed, and range. Capability unit IIIe–2 dryland; Silty range site, 15- to 19-inch precipitation zone; windbreak suitability group 1.

Twin Creek loam, 8 to 15 percent slopes (Tx).—This soil is on foot slopes below shale escarpments in the shale uplands. Many of the areas are dissected by narrow drainageways and gullies spaced 250 to 400 feet apart. Scattered flat sandstone and shale fragments are on the soil surface. The soil has a profile similar to the one described as representative of the series, but it is steeper and has scattered sandstone and shale fragments.

Runoff is rapid, and the hazard of erosion is severe. Most areas receive runoff from the steep soils above them. This soil is suited to watershed, wildlife, recreation, range, hay, pasture, and limited dryfarmed crops. Capability unit IVe–2 dryland; Silty range site, 15- to 19-inch precipitation zone; windbreak suitability group 1.

Twin Creek-Korchea complex, 2 to 8 percent slopes (TY).—This complex is made up of gently sloping soils in the red shale highlands. It is about equal parts of Twin Creek silt loam and Korchea loam. The Twin Creek soil is on the fans and foot slopes where slopes are 5 to 8 percent. The Korchea soil is on the valley bottoms where slopes are 2 to 4 percent.

Included with this soil in mapping are valley bottoms that are 100 to 200 feet wide and fans and foot slopes that border the valleys and are disseced by deep drainageways at intervals of 400 to 600 feet.

Runoff is medium, and the hazard of erosion is moderate. Most areas receive runoff from the steep soils above them. The valley bottom is subject to flooding. These soils are suited to wildlife, recreation, watershed, range, hay, and limited dryfarmed crops. Capability unit IIe–2 dryland; Silty range site, 15- to 19-inch precipitation zone; windbreak suitability group 1.

Vananda Series

The Vananda series consists of deep, nearly level to gently sloping and undulating, well-drained, sodium-affected soils on terraces, fans, and foot slopes. Slopes range from 0 to 8 percent. These soils formed in alkaline clay alluvium derived from fresh- and salt-water shale. Elevation ranges from 2,700 to 3,800 feet.

The native vegetation is mainly greasewood, Sandberg bluegrass, wild onion, and western wheatgrass. Annual precipitation is 13 to 14 inches, the average annual soil temperature is 48° to 50° F, and the frost-free period is 115 to 125 days.

In a representative profile the surface layer is light brownish-gray silty clay about 1 inch thick. The underlying material is grayish-brown and olive-gray clay that extends to a depth of 60 inches or more.

Permeability is very slow, and available water capacity is high. The effective rooting depth is 60 inches or more. These soils are used for range, wildlife, recreation, watershed, and irrigated crops.

Representative profile of Vananda clay, 1 to 8 percent slopes, in grassland, 250 feet north and 300 feet west of the SE. corner sec. 12, T. 2 S., R. 30 E.

A—0 to 1 inch, light brownish-gray (2.5Y 6/2) silty clay, olive gray (5Y 4/2) moist; strong, fine, granular structure; hard, firm, sticky and plastic; slightly effervescent; abrupt boundary.

C1—1 inch to 3 inches, grayish-brown (2.5Y 5/2) clay, olive (5Y 4/3) moist; moderate, coarse, blocky structure; very hard, firm, very sticky and very plastic; strongly effervescent; clear boundary.

C2—3 to 12 inches, grayish-brown (2.5Y 5/2) clay, olive gray (5Y 4/2) moist; moderate, medium and coarse, blocky structure; extremely hard, very firm, very sticky and very plastic; strongly effervescent; clear, wavy boundary.

C3cs—12 to 16 inches, olive-gray (5Y 5/2) clay, olive gray (5Y 4/2) moist; massive; extremely hard, very firm, very sticky and very plastic; strongly effervescent; common crystals of gypsum and other salts; gradual, wavy boundary.

C4cs—16 to 29 inches, olive-gray (5Y 5/2) clay, dark olive gray (5Y 3/2) moist; massive; extremely hard, very firm, very sticky and very plastic; strongly effervescent; common crystals of gypsum and other salts; gradual, wavy boundary.

C5—29 to 60 inches, olive-gray (5Y 5/2) clay, dark olive gray (5Y 3/2) moist; massive; extremely hard, very firm, very sticky and very plastic; strongly effervescent; few gypsum and salt crystals.

The soil between depths of 10 and 40 inches ranges from 45 to 60 percent clay. Hue is 2.5Y or 5Y throughout. The C horizon is grayish brown, light olive gray, olive gray, light gray, and pale olive.

Vananda clay, 0 to 1 percent slopes (Va).—This nearly level soil is on terraces. It has a profile similar to the one described as representative of the series, but it is less sloping. Included in mapping are spots of Kyle clay and Bone clay.

Runoff is slow, and the hazard of erosion is slight. In irrigated areas the water table is within 5 feet of the surface late in summer. This soil is suited to watershed, wildlife, recreation, range, pasture, and limited irrigated crops. Only salt-tolerant plants are suitable unless the salts have been leached out of the soil. Capability unit VIs–1 dryland, IVs–1 irrigated; Dense Clay range site, 10- to 14-inch precipitation zone; windbreak suitability group 3S.

Vananda clay, 1 to 8 percent slopes (Vc).—This soil is in 20- to 100-acre areas on terraces, fans, and foot slopes in the shale highlands. The foot slopes and terraces have narrow rills and gullies spaced 100 to 200 feet apart. The soil has the profile described as representative of the series. Included in mapping are small areas of Allentine and Kyle soils.

Runoff is medium, and the hazard of erosion is moderate. This soil is suited to range, wildlife, recrea-

tion, and watershed. Capability unit VIe–1 dryland; Dense Clay range site, 10- to 14-inch precipitation zone; windbreak suitability group 3S.

Vebar Series

The Vebar series consists of moderately deep, undulating to hilly and steep, well-drained soils on hills and ridges in the sedimentary uplands. Slopes range from 4 to 35 percent. These soils formed in place in material weathered from calcareous sandstone. Elevation ranges from 3,400 to 4,400 feet.

The native vegetation is mainly milkvetch, prairie sandreed, needleandthread, and big sagebrush. Annual precipitation is 14 to 16 inches, the average annual soil temperature is 46° to 47° F, and the frost-free period is 100 to 115 days.

In a representative profile the surface layer is grayish-brown sandy loam about 2 inches thick. The subsoil is grayish-brown, dark-brown, light olive-brown, and light yellowish-brown sandy loam and sandy clay loam about 25 inches thick. The substratum is pale-yellow sandy loam. Weakly consolidated sandstone is at a depth of about 40 inches.

Permeability is moderately rapid, and available water capacity is low. The effective rooting depth is about 40 inches. These soils are used for range, wildlife, recreation, watershed, and dryfarmed crops.

Representative profile of Vebar sandy loam, in an area of Vebar-Castner complex, undulating, in grassland, 200 feet north and 500 feet east of the SW. corner sec. 24, T. 6 S., R. 30 E.

A1—0 to 2 inches, grayish-brown (10YR 5/2) sandy loam, very dark grayish brown (10YR 3/2) moist; weak, medium, granular structure; soft, very friable, nonsticky and slightly plastic; clear boundary.

B1—2 to 4 inches, grayish-brown (10YR 5/2) sandy loam, dark grayish brown (10YR 3/2) moist; weak, medium, prismatic structure parting to weak, thick, platy; slightly hard, friable, slightly sticky and slightly plastic; clear boundary.

B21—4 to 10 inches, dark-brown (10YR 4/3) sandy loam, dark brown (10YR 3/3 rubbed, 3/2 coats) moist; moderate, medium, prismatic structure; hard, friable, sticky and plastic; few clay bridges between sand grains; clear, wavy boundary.

B22—10 to 15 inches, light olive-brown (2.5Y 5/4) sandy clay loam, olive brown (2.5Y 4/4) moist; moderate, coarse, prismatic structure; hard, friable, slightly sticky and plastic; few clay bridges between sand grains; gradual, wavy boundary.

B3—15 to 27 inches, light yellowish-brown (2.5Y 6/4) sandy loam, light olive brown (2.5Y 5/4) moist; weak, coarse, prismatic structure; hard, friable, slightly sticky and slightly plastic; gradual, wavy boundary.

C1ca—27 to 40 inches, pale-yellow (2.5Y 7/4) sandy loam, light yellowish brown (2.5Y 6/4) moist; massive; hard, friable, nonsticky and nonplastic; appears to be weathered sandstone penetrated by a few plant roots; strongly effervescent; diffuse, smooth boundary.

C2—40 to 55 inches, weakly consolidated sandstone, strongly effervescent.

Depth to calcareous material ranges from 18 to 30 inches, and depth to sandstone, from 20 to 40 inches. The soil between depths of 10 and 40 inches ranges from 10 to 18 percent clay. Hue ranges from 10YR to 2.5Y throughout. The A horizon is dark grayish brown, grayish brown, and brown. The B2 horizon is brown, grayish brown, dark brown, light olive brown, and light brownish gray. The C horizon is light yellowish brown and pale yellow.

Vebar fine sandy loam, undulating (Vd).—This undulating soil is on low ridges and hills in the sandstone highlands. Areas are less than 40 acres in size. Slopes are 4 to 8 percent. Local relief is 15 to 30 feet. The soil has a profile similar to the one described as representative of the series, but the surface layer is fine sandy loam. Included in mapping are small areas of Parshall fine sandy loam.

Runoff is medium, and the hazard of erosion is moderate. This soil is suited to dryfarmed crops, hay, wildlife, recreation, watershed, and range. Capability unit IIIe–2 dryland; Sandy range site, 15- to 19-inch precipitation zone; windbreak suitability group 2M.

Vebar fine sandy loam, rolling (Ve).—This rolling soil is on ridges and hills in the sandstone highlands. Slopes are 8 to 15 percent. Local relief ranges from 25 to 60 feet. The soil has a profile similar to the one described as representative of the series, but it is steeper, and the surface layer is fine sandy loam.

Runoff is medium, and the hazard of erosion is moderate. This soil is suited to range, wildlife, recreation, watershed, hay, pasture, and dryfarmed crops. Capability unit IVe–2 dryland; Sandy range site, 15 to 19-inch precipitation zone; windbreak suitability group 2M.

Vebar-Castner complex, undulating (VF).—This complex is made up of undulating soils on hills and ridges in the sedimentary uplands. It is 50 percent Vebar sandy loam, 40 percent Castner sandy loam, and 10 percent Rock outcrop and Reeder loam. Slopes are 4 to 8 percent. The soils are intermixed, but the Castner soil typically is in the vicinity of Rock outcrop. The Vebar soil in this complex has the profile described as representative of the Vebar series. The Castner soil has a profile similar to the one described as representative of the Castner series, but it is less sloping. Included in mapping are areas of soils that have a light reddish-brown substratum.

Runoff is medium, and the hazard of erosion is moderate. These soils are suited to range, wildlife, recreation, and watershed. Capability unit VIs–1 dryland; Sandy range site, 15- to 19-inch precipitation zone; windbreak suitabilty group 3M.

Vebar-Castner complex, rolling (VH).—This complex is made up of rolling soils on hills and ridges in the sedimentary uplands. It is about 50 percent Vebar sandy loam, 40 percent Castner sandy loam, and 10 percent Rock outcrop. Slopes are 8 to 15 percent. The Castner soil is typically in the vicinity of Rock outcrop. The Vebar soil in this complex has a profile similar to the one described as representative of the Vebar series, but it is steeper. Included in mapping are areas of soils that have a substratum of loam.

Runoff is medium, and the hazard of erosion is moderate. These soils are suited to range, wildlife, recreation, and watershed. Capability unit VIs–1 dryland; Sandy range site, 15- to 19-inch precipitation zone: windbreak suitability group 3M.

Vebar complex, rolling (VM).—This complex is made up of rolling and hilly soils on hills and ridges in the sedimentary uplands. It is 60 percent Vebar fine sandy loam, 25 percent Dast sandy loam. 10 percent Farnuf loam and Farnuf sandy loam, and 5 percent Rock outcrop. Slopes are mostly 8 to 15 percent, but they range

to 25 percent. The Vebar and Farnuf soils are on the tops and sides of wide ridges. The Farnuf sandy loam is also on foot slopes. The Dast soil is on narrow ridges, hills, and sides of deep drainageways. It has slopes of 15 to 25 percent. The Vebar and Dast soils in this complex have profiles similar to the ones described as representative of their respective series, but they are steeper, and the Vebar soil has a surface layer of fine sandy loam 6 to 8 inches thick.

Included with these soils in mapping are areas of soils that are similar to this Vebar soil but that do not have sandstone within 40 inches of the surface.

Runoff is medium, and the hazard of erosion is moderate. These soils are suited to range, wildlife, recreation, watershed, and pasture. Capability unit IVe–2 dryland; Sandy range site, 15- to 19-inch precipitation zone; windbreak suitability group 2M.

Wages Series

The Wages series consists of deep, nearly level to gently sloping, well-drained soils on fans, foot slopes, and terraces. Slopes range from 0 to 8 percent. These soils formed in calcareous alluvium. Elevation ranges from 3,000 to 3,600 feet.

The native vegetation is mainly western wheatgrass, big sagebrush, cudweed sagewort, and green needlegrass. Annual precipitation is 13 to 14 inches, the average annual soil temperature is 47° to 49° F, and the frost-free period is 105 to 115 days.

In a representative profile the surface layer is grayish-brown loam about 6 inches thick. The subsoil is brown and light brownish-gray clay loam and loam about 16 inches thick. The substratum is light brownish-gray clay loam that grades to light-gray fine sandy loam and extends to a depth of 60 inches or more.

Permeability is moderate, and available water capacity is high. The effective rooting depth is 60 inches or more. These soils are used for irrigated and dryfarmed crops, watershed, wildlife, recreation, and range.

Representative profile of Wages loam, 4 to 8 percent slopes, in a cultivated area, 1,320 feet south of the center of sec. 6, T. 1 S., R. 37 E.

Ap—0 to 6 inches, grayish-brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; weak, blocky structure parting to weak, medium, granular; hard, friable, nonsticky and slightly plastic; abrupt, smooth boundary.

B21t—6 to 9 inches, brown (10YR 5/3) clay loam, dark brown (10YR 3/3) moist; moderate, medium and coarse, prismatic structure; hard, friable, sticky and plastic; thin, patchy clay films on peds; gradual, wavy boundary.

B22t—9 to 13 inches, brown (10YR 5/3) light clay loam, dark brown (10YR 3/3) moist; moderate, coarse, prismatic structure; hard, friable, sticky and plastic; thin, patchy clay films on peds; clear, wavy boundary.

B3ca—13 to 22 inches, light brownish-gray (10YR 6/2) loam, dark grayish brown (10YR 4/2) moist; weak, coarse, blocky structure; hard, friable, slightly sticky and slightly plastic; slightly effervescent; few fine, soft, segregated lime masses; clear, wavy boundary.

C1ca—22 to 31 inches, light brownish-gray (10YR 6/2) light clay loam, dark grayish brown (10YR 4/2) moist; massive; hard, friable, slightly sticky and plastic; strongly effervescent; common fine, soft, segregated lime masses; clear, wavy boundary.

C2—31 to 60 inches, light-gary (10YR 7/2) fine sandy loam, brown (10YR 5/3) moist; massive; slightly hard, friable, nonsticky and slightly plastic; strongly effervescent; few fine, soft, segregated lime masses.

Depth to calcareous material ranges from 10 to 13 inches. The dark-colored surface layer ranges from 8 to 12 inches in thickness. Hue is 10YR to 2.5Y throughout. The A horizon is grayish-brown and dark grayish-brown loam, silt loam, or very fine sandy loam. The B2t horizon is heavy loam or clay loam. The Bca and Cca horizons are pale brown, light brownish gray, and light gray.

Wages loam, 0 to 2 percent slopes (Wa).—This nearly level soil is on terraces and fans. Areas range from 5 to 20 acres in size. The soil has a profile similar to the one described as representative of the series, but it is less sloping.

Included with this soil in mapping are areas of Lohmiller silty clay loam and areas of soils that have 5 to 15 percent gravel on the surface and throughout the soil.

Runoff is slow, and the hazard of erosion is slight. This soil is suited to irrigated and dryfarmed crops, hay, watershed, wildlife, recreation, and range. Capability unit IIIc–1 dryland, IIc–1 irrigated; Silty range site, 10- to 14-inch precipitation zone; windbreak suitability group 1.

Wages loam, 2 to 4 percent slopes (Wb).—This soil is on terraces and fans. Areas range from 5 to 30 acres in size. The soil has a profile similar to the one described as representative of the series, but it is less sloping.

Included with this soil in mapping in the burned shale highlands are areas of reddish-brown soils that have procelanite gravel on the surface and throughout the soil.

Runoff is slow, and the hazard of erosion is slight. This soil is suited to irrigated and dryfarmed crops, hay, watershed, wildlife, recreation, and range. Capability unit IIIe–3 dryland, IIe–1 irrigated; Silty range site, 10- to 14-inch precipitation zone; windbreak suitability group 1.

Wages loam, 4 to 8 percent slopes (Wc).—This soil is on fans and foot slopes. Areas range from 10 to 20 acres in size. The soil has the profile described as representative of the series. Included in mapping are areas of reddish-brown soils that have procelanite gravel on the surface and throughout the soil.

Runoff is medium, and the hazard of erosion is moderate. This soil is suited to irrigated and dryfarmed crops, hay, watershed, wildlife, recreation, and range. Cultivated areas need protection against runoff from soils above them. Capability unit IIIe–3 dryland, IIIe–1 irrigated; Silty range site 10- to 14-inch precipitation zone; windbreak suitability group 1.

Wayden Series

The Wayden series consists of shallow, strongly sloping to very steep and rolling to hilly, excessively drained soils on hills and ridges in dissected sedimentary uplands. Slopes range from 8 to 55 percent. These soils formed in material weathered in place from clay shale. Elevation ranges from 3,600 to 4,600 feet.

The native vegetation is mainly bluebunch wheatgrass, scurfpea, broom snakeweed, and western wheatgrass. Annual precipitation is 14 to 17 inches, the average annual soil temperature is 45° to 47° F, and the frost-free period is 90 to 105 days.

In a representative profile the surface layer is grayish-brown silty clay loam about 2 inches thick. The subsoil is grayish-brown silty clay loam about 5 inches thick. The substratum is light brownish-gray silty clay loam that is about 35 percent weathered shale chips. Shale is at a depth of about 19 inches.

Permeability is slow, and available water capacity is very low or low. The effective rooting depth is about 20 inches. These soils are used for range, wildlife, recreation, and watershed.

Representative profile of Wayden silty clay loam, rolling, in grassland, 1,400 feet west of the center of sec. 20, T. 5 S., R. 29 E.

A—0 to 2 inches, grayish-brown (2.5Y 5/2) light silty clay loam, dark grayish brown (2.5Y 4/2) moist; weak, thin, platy structure parting to moderate, fine, granular; hard, friable, slightly sticky and plastic; many fine roots; slightly effervescent; clear, smooth boundary.

B2—2 to 7 inches, grayish-brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; weak, coarse, prismatic structure parting to weak, coarse, blocky; very hard, firm, sticky and very plastic; common fine roots; common very fine pores; strongly effervescent; clear, wavy boundary.

C1—7 to 11 inches, light brownish-gray (2.5Y 6/2) heavy silty clay loam, grayish brown (2.5Y 5/2) moist; weak, coarse, prismatic structure parting to weak, fine, blocky; very hard, firm, sticky and very plastic; common fine roots; common fine pores; 15 percent (volume) weathered fine shale chips; strongly effervescent; few fine, soft lime masses; gradual, wavy boundary.

C2—11 to 14 inches, light brownish-gray (2.5Y 6/2) heavy silty clay loam, grayish brown (2.5Y 5/2) moist; strong, coarse and very coarse, platy structure; very hard, firm, very sticky and very plastic; few fine roots; few fine pores; 30 percent (volume) weathered, fine shale chips; strongly effervescent; few fine lime threads and medium lime masses; gradual, wavy boundary.

C3—14 to 19 inches, light brownish-gray (2.5Y 6/2) heavy silty clay loam, grayish brown (2.5Y 5/2) moist; strong, very thick, platy structure; very hard, very firm, very sticky and very plastic; few fine roots; few fine pores; 50 percent (volume) weathered shale chips; strongly effervescent; few coarse, soft lime masses; diffuse, smooth boundary.

C4—19 to 28 inches, platy shale, root mats between the horizontal layers of shale.

Depth to soft shale ranges from 10 to 20 inches. The soil is silty clay, clay loam, or silty clay loam. Hue is 2.5Y or 5Y throughout. The A horizon is grayish brown and light brownish gray. The C horizon is light brownish gray, light olive gray, and pale olive.

Wayden silty clay loam, rolling (WD).—This rolling soil is on deeply dissected clay shale highlands. Slopes are 8 to 15 percent. Slopes range from 100 to 300 feet long. The soil has the profile described as representative of the series. Included in mapping were 2- to 5-acre areas of Regent silty clay loam.

Runoff is medium, and the hazard of erosion is moderate. This soil is suited to range, wildlife, recreation, and watershed. Capability unit VIe–1 dryland; Clayey range site, 15- to 19-inch precipitation zone; windbreak suitability group 3M.

Wayden silty clay loam, hilly (WE).—This hilly and steep soil is on deeply dissected clay shale highlands. Slopes are 15 to 35 percent. The points and steep sides of the ridges have scattered areas of Shale outcrop. The soil has a profile similar to the one described as representative of the series, but it is steeper.

Included with this soil in mapping are areas of soils that have a surface layer of clay loam. Shale outcrop makes up 15 to 20 percent of some areas of this mapping unit.

Runoff is rapid, and the hazard of erosion is severe. This soil is suited to range, wildlife, recreation, and watershed. Capability unit VIe–1 dryland; Thin Hilly range site, 15- to 19-inch precipitation zone; windbreak suitability group 4.

Wayden-Arnegard complex, hilly (WF).—This complex is made up of hilly and very steep soils on deeply dissected sedimentary uplands. It is about 35 percent Wayden silty clay loam, 35 percent Arnegard loam, and 20 percent Doney loam. Slopes are mostly 15 to 35 percent, but they range to 75 percent. The Wayden and Doney soils have slopes of 25 to 45 percent and are on ridges and upper side slopes. The Arnegard soil is on narrow valley fans and foot slopes and includes several seep spots. The Wayden and Arnegard soils in this complex have profiles similar to the ones described as representative of their respective series, but they are steeper. The vegetation consists of serviceberry, plum, snowberry, cinquefoil, mountain maple, ash, thornapple, roses, and thick patches of aspen around the seeps.

Included with these soils in mapping are areas of Castner loam, Regent silty clay loam, and Rock outcrop that make up about 10 percent of the total acreage of this mapping unit. Rock outcrop is on the steep west faces of escarpments.

Runoff is rapid, and the hazard of erosion is severe. These soils are suited to range, wildlife, recreation, and watershed. Capability unit VIe–1 dryland; Thin Hilly range site, 15- to 19-inch precipitation zone; windbreak suitability group 4.

Wayden-Grail complex, hilly (WG).—This complex is made up of hilly and steep soils on deeply dissected sedimentary uplands. It is about 40 percent Wayden silty clay loam and 30 percent Grail clay loam. Slopes are mostly 15 to 35 percent, but they range to 8 percent. The Wayden soil is on shale ridges where erosion has removed the gravelly terrace material. The Grail soil is in troughs and depressions between the gravelly ridges and in drainageways that have seeps and springs. The Wayden and Grail soils in this complex have profiles similar to the ones described as representative of their respective series, but they are steeper.

Included with these soils in mapping are about 20 percent Judith gravelly loam on the gravelly ridges and terrace escarpments, and about 10 percent Regent silty clay loam and Shaak silty clay loam.

Runoff is medium, and the hazard of erosion is moderate. These soils are suited to range, recreation, watershed, and game range. Capability unit VIe–1 dryland; Clayey range site, 15- to 19-inch precipitation zone; windbreak suitability group 4.

Wayden-Judith silty clay loams, hilly (WH).—This complex is made up of hilly and steep soils on deeply dissected sedimentary uplands. It is about 50 percent Wayden silty clay loam; 30 percent Judith gravelly loam; and 20 percent Regent silty clay loam, Grail clay loam, and Shaak silty clay loam. Slopes are mostly 15 to 35 percent, but they range to 8 percent. The Judith soil is on gravelly ridges and in a band on the terrace escarpments. The Wayden soil is on gravel-free ridges and side slopes. The Grail soil is marked by patches of brush and is at the head and in the bottoms of drainageways and on northeast-facing terrace edges. Slopes are 8 to 15 percent on the Judith and Grail soils and 15 to 25 percent on the Wayden soil. The Judith soil in this complex has a profile similar to the one described as representative of the Judith series, but it is steeper, and the surface layer is gravelly loam.

Runoff is rapid, and the hazard of erosion is severe. These soils are used for range, recreation, watershed, and wildlife. Capability unit VIe–1 dryland; Clayey range site, 15- to 19-inch precipitation zone; windbreak suitability group 4.

Wayden-Regent silty clay loams, hilly (WI).—This complex is made up of hilly and steep soils on deeply dissected sedimentary uplands. It is 50 percent Wayden silty clay loam, 25 percent Regent silty clay loam, 10 percent Shale outcrop, and 15 percent Savage and Cherry silty clay loams. The Wayden soil is on narrow ridges and side slopes and has slopes of 30 percent or more. The Regent soil is on broad ridges, in tributary valleys, and on the north sides of ridges. It has slopes of 15 to 30 percent. The Savage and Cherry soils are on foot slopes. The Wayden and Regent soils in this complex have profiles similar to the ones described as representative of their respective series, but they are steeper.

Runoff is rapid, and the hazard of erosion is severe. These soils are used for range, recreation, watershed, and game range. Capability unit VIe–1 dryland; Thin Hilly range site, 15- to 19-inch precipitation zone; windbreak suitability group 4.

Wayden-Savage silty clay loams, rolling (WK).—This complex is made up of rolling and hilly soils on deeply dissected sedimentary uplands. It is 45 percent Wayden silty clay loam, 30 percent Savage silty clay loam, and 25 percent Regent silty clay loam. Slopes are mostly 8 to 15 percent, but they range to 20 percent. The Wayden soil is on narrow ridges and knolls. The Savage soil is on foot slopes, bottoms, and fans. The Regent soil is on the north sides of low ridges. The Wayden and Savage soils in this complex have profiles similar to the ones described as representative of their respective series, but they are steeper.

Runoff is medium, and the hazard of erosion is moderate. These soils are used for wildlife, recreation, watershed, range, hay, and pasture. Capability unit IVe–2 dryland; Clayey range site, 15- to 19-inch precipitation zone; windbreak suitability group 2M.

Wayden-Rock outcrop complex, rolling (WL).—This complex is made up of rolling soils on deeply dissected sedimentary uplands. It is 55 percent Wayden silty clay loam, 35 percent Regent silty clay loam and Savage silty clay loam, and 15 percent Rock outcrop. Slopes are 8 to 15 percent. The Wayden soil is on narrow ridges and hills. The Regent soil is on broad ridges. The Savage soil is on fans, foot slopes, and the bottoms of narrow drainageways. Rock outcrop is on peaks of narrow ridges and in eroded drainageways.

Runoff is medium, and the hazard of erosion is moderate. These soils are used for range, wildlife, recreation, and watershed. Capability unit VIe–1 dryland; Clayey range site, 15- to 19-inch precipitation zone; windbreak suitability group 3M.

Wayden-Rock outcrop complex, hilly (WM).—This complex is made up of hilly and steep soils on deeply dissected sedimentary uplands. It is 60 percent Wayden silty clay loam, 20 percent Rock outcrop, and 20 percent Regent silty clay loam and Savage silty clay loam. Slopes are mostly 15 to 25 percent, but they range to 35 percent. The Wayden soil is on narrow shale ridges and steep slopes. The Regent soil is on broad ridges. The Savage soil is on fans, foot slopes, and the bottoms of narrow drainageways. Rock outcrop is on peaks of narrow ridges and in steep, eroded drainageways. The Wayden soil in this complex has a profile similar to the one described as representative of the series, but it is steeper.

Runoff is rapid, and the hazard of erosion is severe. These soils are used for range, recreation, wildlife, and watershed. Capability unit VIe–1 dryland; Thin Hilly range site, 15- to 19-inch precipitation zone; windbreak suitability group 4.

Wayden-Shale outcrop complex, very steep (WN).—This complex is made up of very steep soils on deeply dissected sedimentary uplands. It is about 50 percent Wayden silty clay loam and 50 percent Shale outcrop. Slopes are mostly 35 to 90 percent, but they range to 25 percent. The Wayden soil is on ridges and hills where slopes range from 25 to 55 percent. Shale outcrop is on the points of ridges, the lower sides of hills and ridges, and the sides of eroding drainageways. It has slopes of 50 to 90 percent. The Wayden soil in this complex has a profile similar to the one described as representative of the series, but it is steeper.

Runoff is rapid, and the hazard of erosion is severe. Runoff waters carry large amounts of sediment. These soils are used for range, wildlife, recreation, and watershed. Capability unit VIIe–1 dryland; Shale range site, 15- to 19-inch precipitation zone; windbreak suitability group 4.

Wayden complex, hilly (WO).—This complex is made up of hilly and steep soils on deeply dissected sedimentary uplands. It is about 60 percent Wayden silty clay loam, 20 percent Rock outcrop, and 20 percent Dast stony sandy loam, Castner loam, and Reeder loam. The Wayden soil is between the sandstone ledges on the hilly valley side slopes where slopes are mostly 15 to 25 percent but range to 35 percent. The Castner soil is on hilltops above the ledges. The Dast soil is below the sandstone ledges. The Wayden soil in this complex has a profile similar to the one described as representative of the series, but it is steeper. Included in mapping are areas of a soil that have a light reddish-brown subsoil.

Runoff is rapid, and the hazard of erosion is severe. These soils are used for range, wildlife, recreation, and watershed. Capability unit VIIe–1 dryland; Thin

Breaks range site, 15- to 19-inch precipitation zone; windbreak suitability group 4.

Wibaux Series

The Wibaux series consists of shallow, undulating to very steep, excessively drained soils on dissected sedimentary uplands. Slopes range from 4 to 90 percent. These soils formed in material weathered in place from red burned shale and porcelanite. Elevation ranges from 3,400 to 4,100 feet.

The native vegetation is mainly bluebunch wheatgrass, needleandthread, fringed sagewort, broom snakeweed, and rubber rabbitbrush. Annual precipitation is 11 to 13 inches, the average annual soil temperature is 49° to 52° F, and the frost-free period is 110 to 120 days.

In a representative profile the surface layer is reddish-brown channery loam about 2 inches thick. The underlying material is reddish-brown channery loam and very channery loam. Hard, red shale and sandstone are at a depth of about 9 inches.

Permeability is moderate, and available water capacity is very low. The effective rooting depth is about 10 inches. These soils are used for range, wildlife, recreation, and watershed.

Representative profile of Wibaux channery loam, in an area of Wibaux-Spearman complex, rolling, in grassland, 1,400 feet east and 200 feet south of the NW. corner sec. 23, T. 7 S., R. 40 E.

A—0 to 2 inches, reddish-brown (2.5YR 5/4) channery loam, dark reddish brown (2.5YR 3/4) moist; weak, thin, platy structure; soft, friable, nonsticky and slightly plastic; 25 percent (volume) thin, hard shale fragments of channer size; clear, smooth boundary.

C1—2 to 5 inches, reddish-brown (2.5YR 4/4) channery loam, dark reddish brown (2.5YR 3/4) moist; weak, medium, blocky structure; slightly hard, friable, slightly sticky and slightly plastic; 25 percent (volume) shale fragments of channer size; clear, wavy boundary.

C2—5 to 9 inches, reddish-brown (2.5YR 5/4) very channery loam, reddish brown (2.5YR 4/4) moist; massive; slightly hard, friable slightly sticky and slightly plastic; 65 percent (volume) hard shale fragments of channer size; slightly effervescent; abrupt, irregular boundary.

R—9 to 12 inches, fractured, hard, red shale and sandstone.

Depth to bedrock ranges from 8 to 20 inches. The soil ranges from 15 to 70 percent coarse fragments but averages 65 percent. The A horizon is brown, dark brown, and reddish brown in hue of 2.5YR to 7.5YR. The C horizon is weak red, reddish brown, light reddish brown, and light brown in hue of 7.5YR to 10R.

Wibaux loam, hilly (Wp).—This hilly and steep soil is in 40- to 300-acre areas on dissected burned shale highlands. It occupies hills, ridges, and valley sides. Slopes are 15 to 35 percent. The soil has a profile similar to the one described as representative of the series, but the surface layer is loam. Included in mapping are a few outcrops of red shale and porcelanite boulders on the steep soils on hillsides.

Runoff is rapid, and the hazard of erosion is severe. This soil is used for range, wildlife, recreation, and watershed. Capability unit VIe–1 dryland; Shallow range site, 10- to 14-inch precipitation zone; windbreak suitability group 3M.

Wibaux-Spearman complex, rolling (Wr).—This complex is made up of rolling soils on dissected sedimentary uplands. It is 55 percent Wibaux channery loam, 40 percent Spearman loam, and 5 percent Chugter loam. Slopes are 8 to 15 percent. The Wibaux soil is on ridges and hills and along the edges of drainageways. The Spearman soil is in drainageways and on broad ridges. The Chugter soil is in the bottoms of drainageways. The Wibaux soil in this complex has the profile described as representative of the Wibaux series. The Spearman soil has a profile similar to the one described as representative of the Spearman series, but it is steeper. Included in mapping are outcrops of shale and sandstone and areas of Hydro loam.

Runoff is medium, and the hazard of erosion is moderate. These soils are used for range, wildlife, recreation, and watershed. Capability unit VIe–1 dryland; Shallow range site, 10- to 14-inch precipitation zone; windbreak suitability group 3M.

Windham Series

The Windham series consists of deep, gently sloping to very steep and hilly, well-drained soils on deeply dissected high terraces and fans. Slopes range from 4 to 75 percent. These soils formed in strongly calcareous gravelly loam and clay loam alluvium derived from limestone, siltstone, and quartzite rock. Elevation ranges from 3,900 to 5,200 feet.

The native vegetation is mainly slender wheatgrass, bluegrass, Hoods phlox, cudweed sagewort, and prairie junegrass. Annual precipitation is 15 to 18 inches, the average annual soil temperature is 45° to 47° F, and the frost-free period is 90 to 110 days.

In a representative profile the surface layer is dark grayish-brown gravelly loam about 5 inches thick. The upper part of the underlying material is dark grayish-brown and light brownish-gray gravelly loam. The lower part is very pale brown very gravelly loam and very gravelly clay loam that extends to a depth of 60 inches or more. Limestone fragments of gravel and cobble size make up about half the volume of the underlying material.

Permeability is slow, and available water capacity is low. The effective rooting depth is 50 inches or more. These soils are used for range, wildlife recreation, and watershed.

Representative profile of Windham gravelly loam, in an area of Windham-Norbert complex, 15 to 50 percent slopes, in grassland, in the center of sec. 31, T. 7 S., R. 34 E.

A—0 to 5 inches, dark grayish-brown (10YR 4/2) gravelly loam, very dark brown (10YR 2/2) moist; weak, medium, granular structure; soft, very friable, nonsticky and slightly plastic; 30 percent (volume) limestone fragments of pebble size; slightly effervescent; clear, smooth boundary.

C1—5 to 8 inches, dark grayish-brown (10YR 4/2) gravelly loam, very dark grayish brown (10YR 3/2) moist; weak, fine, subangular blocky structure; slightly hard, friable, nonsticky and slightly plastic; 40 percent (volume) limestone fragments of pebble and cobble size; strongly effervescent; clear, wavy boundary.

C2—8 to 14 inches, light brownish-gray (10YR 6/2) gravelly loam, brown (10YR 5/3) moist; massive; slightly hard, friable, slightly sticky and slightly

plastic; 45 percent (volume) limestone fragments of pebble and cobble size; strongly effervescent; clear, wavy boundary.

C3ca—14 to 23 inches, very pale brown (10YR 8/3) very gravelly loam, pale brown (10YR 6/3) moist; massive; hard, friable, slightly sticky and slightly plastic; 50 percent (volume) limestone fragments of pebble and cobble size; violently effervescent; lime coatings on pebbles; clear, wavy boundary.

C4ca—23 to 37 inches, very pale brown (10YR 7/3) very gravelly loam, pale brown (10YR 6/8) moist; massive; soft, very friable, slightly sticky and slightly plastic; 60 percent (volume) limestone fragments of pebble and cobble size; strongly effervescent; lime coatings on pebbles; gradual, wavy boundary.

C5ca—37 to 60 inches, very pale brown (10YR 7/3) very gravelly clay loam, light brownish gray (10YR 6/2) moist; massive; hard, friable, sticky and plastic; 55 percent (volume) limestone fragments of pebble and cobble size; strongly effervescent; lime coatings on pebbles.

The soil between depths of 10 and 40 inches is light clay loam or heavy loam and ranges from 50 to 70 percent coarse fragments of pebble and cobble size. Hue is 10YR or 7.5YR throughout. The A horizon is dark grayish-brown, grayish brown, and brown loam, gravelly loam, or cobbly loam. The Cca horizon is pink, pinkish white, very pale brown, and light gray.

Windham cobbly loam, 15 to 35 percent slopes (Ws).—This moderately steep and steep soil is on deeply dissected gravelly benches. Areas are narrow and several thousand feet long. Local relief ranges from 10 to 50 feet. Slopes are 50 to 100 feet long. The soil has a profile similar to the one described as representative of the series, but about 25 to 35 percent of the coarse fragments are cobbles. Included in mapping are areas of Judith cobbly loam and Eltsac clay.

Runoff is rapid, and the hazard of erosion is severe. This soil is used for range, wildlife, recreation, and watershed. Capability unit VIe–1 dryland; Shallow to Gravel range site, 15- to 19-inch precipitation zone; windbreak suitability group 4.

Windham complex, 15 to 35 percent slopes (WT).—This complex is made up of moderately steep and steep soils on deeply dissected gravelly benches that are underlain by shale. It is about 50 percent Windham cobbly loam, 40 percent Judith cobbly loam, and 10 percent Danvers silty clay loam. The Windham soil is in drainageways, on narrow ridges, and on the lower edges of fans and foot slopes. The Judith soil is in a band below the residual soils on fans and foot slopes. It has slopes of 15 to 20 percent. The Windham and Judith soils in this complex have profiles similar to the ones described as representative of their respective series, but cobbles and stones cover 5 to 20 percent of the surface.

Runoff is rapid, and the hazard of erosion is high. These soils are used for range, recreation, watershed, and game range. Capability unit VIe–1 dryland; Thin Hilly range site, 15- to 19-inch precipitation zone; windbreak suitability group 4.

Windham-Arnegard complex, 15 to 35 percent slopes (WU).—This complex is made up of moderately steep and steep soils on deeply dissected gravelly benches that are underlain by shale. It is about 40 percent Windham cobbly loam, 40 percent Arnegard loam, and 20 percent Lap channery loam. The Lap and Windham soils are at the bases of the mountains and on the tops of ridges. The Arnegard soil is on the sides of ridges and in troughs between the ridges. The Windham and Arnegard soils in this complex have profiles similar to the ones described as representative of their respective series, but they are steeper, and the Windham soil has a cobbly surface.

Runoff is rapid, and the hazard of erosion is severe. These soils are used for range, recreation, watershed, and game range. Capability unit VIe–1 dryland; Thin Hilly range site, 15- to 19-inch precipitation zone; windbreak suitability group 4.

Windham-Norbert complex, 15 to 50 percent slopes (WV).—This complex is made up of moderately steep and very steep soils on deeply dissected high gravel terraces that are underlain by shale. It is about 55 percent Windham gravelly loam and 45 percent Norbert clay. The Windham soil is on the upper parts of ridges and hills. The Norbert soil is on the lower parts of ridges and in drainageways where soft shale bedrock has been exposed. Scattered gravel is on the surface of the Norbert soil where it is just below areas of Windham soil. The Windham soil in this complex has the profile described as representative of the Windham series. Included in mapping is Shale outcrop in areas of the Norbert soil.

Runoff is rapid, and the hazard of erosion is severe. These soils are used for range, wildlife, recreation, and watershed. Capability unit VIe–1 dryland; Thin Hilly range site, 15- to 19-inch precipitation zone; windbreak suitability group 4.

Windham-Wayden complex, 15 to 35 percent slopes (WW).—This complex is made up of moderately steep and steep soils on deeply dissected terraces and benches that are underlain by shale. It is about 60 percent Windham cobbly loam and 40 percent Wayden silty clay loam. The Windham soil is on ridges and hills that are covered by gravelly material. The Wayden soil is on the lower parts of ridges where shale bedrock is near the surface. The Windham soil in this complex has a profile similar to the one described as representative of the Windham series, but the surface layer is cobbly.

Runoff is rapid, and the hazard of erosion is severe. These soils are used for range, wildlife, recreation, and watershed. Capability unit VIe–1 dryland; Thin Hilly range site, 15- to 19-inch precipitation zone; windbreak suitability group 4.

Windham-Lap association, very steep (WX).—This association is made up of moderately steep and very steep soils on deeply dissected gravelly benches that are underlain by shale. It is 40 percent Lap very stony loam, 55 percent Windham stony and very stony loam, and 5 percent Rock outcrop. Slopes are mostly 35 to 75 percent, but they range to 15 percent. The Windham soil is on the upper parts of ridges and hills and below the rock ledges. The Lap soil is in bands above the rock ledges and on sharp spur ridges. The Windham and Lap soils in this association have profiles similar to the ones described as representative of their respective series, but the surface layer is stony and very stony.

Runoff is rapid, and the hazard of erosion is severe. These soils are used for game range, recreation, watershed, and range. Capability unit VIIe–1 dryland;

Thin Hilly range site, 15- to 19-inch precipitation zone; windbreak suitability group 4.

Winnett Series

The Winnett series consists of moderately deep, undulating, well-drained, sodium-affected soils in the sedimentary uplands. Slopes range from 4 to 8 percent. These soils formed in place in material weathered from alkaline clay loam and silty clay loam shale. Elevation ranges from 3,300 to 3,700 feet.

The native vegetation is mainly milkvetch, Sandberg bluegrass, big sagebrush, greasewood, prairie junegrass, and western wheatgrass. Annual precipitation is 13 to 14 inches, the average annual soil temperature is 47° to 49° F, and the frost-free period is 110 to 120 days.

In a representative profile the surface layer is light brownish-gray loam about 5 inches thick. The subsoil is grayish-brown, light olive-brown, and olive clay about 17 inches thick. The substratum is pale-olive clay loam. Interbedded clay shale, siltstone, and sandstone are at a depth of about 26 inches.

Permeability is very slow, and available water capacity is low or moderate. The effective rooting depth is about 26 inches. These soils are used for range, wildlife, recreation, and watershed.

Representative profile of Winnett loam, in an area of Winnett complex, undulating, in grassland, 2,200 feet south and 25 feet west of the center of sec. 5, T. 3 S., R. 35 E.

A21—0 to 2 inches, light brownish-gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; massive; hard, friable, slightly sticky and slightly plastic; many very fine and micro roots; common very fine and micro pores; clear, smooth boundary.

A22—2 to 5 inches, light brownish-gray (2.5Y 6/2) heavy loam, dark grayish brown (2.5Y 4/2) moist; moderate, thin, platy structure; hard, friable, sticky and slightly plastic; many very fine and micro roots; few micro pores; abrupt, smooth boundary.

B21t—5 to 11 inches, grayish-brown (2.5Y 5/2) clay, very dark grayish brown (2.5Y 3/2) moist; moderate, coarse, prismatic structure; very hard, very firm, very sticky and very plastic; common micro roots; few micro pores; moderately thick clay films on peds; tops of the prisms coated with clean sand and silt grains that are light brownish-gray (2.5Y 6/2) dry; gradual, wavy boundary.

B22t—11 to 15 inches, light olive-brown (2.5Y 5/4) clay, olive brown (2.5Y 4/4) moist; moderate, medium, prismatic structure parting to moderate, medium, blocky; very hard, very firm, very sticky and very plastic; common micro roots; moderately thick, patchy clay films on peds; very slightly effervescent; few fine gypsum crystals; clear, wavy boundary.

B3csca—15 to 22 inches, olive (5Y 5/3) clay, olive (5Y 4/3) moist; weak, medium, prismatic structure parting to weak, medium, blocky; very hard, very firm, very sticky and very plastic; common very fine roots; few very fine pores; slightly effervescent; common fine masses of gypsum crystals; few fine, soft lime masses.

C1cs—22 to 26 inches, pale-olive (5Y 6/3) clay loam, olive (5Y 4/3) moist; weak, coarse, blocky structure; very hard, firm, very sticky and plastic; few fine roots; few micro pores; slightly effervescent; few fine gypsum crystals; diffuse, wavy boundary.

C2—26 inches, pale-olive (5Y 6/3) interbedded clay shale, siltstone, and sandstone, olive (5Y 5/4) moist.

Depth to shale ranges from 20 to 40 inches, and depth to the Bcsca horizon, from 12 to 18 inches. Estimated exchangeable sodium ranges from 8 to 15 percent in the B2t horizon and from 15 to 25 percent in the Bcs and C horizons. The A2 and B2t horizons have hue of 10YR or 2.5Y. The B2t horizon is 45 to 55 percent clay. The C horizon is light yellowish brown and pale olive in hue of 5Y or 2.5Y.

Winnett complex, undulating (Wy).—This complex is made up of undulating soils on ridges and hills in the shale highlands. It is about 70 percent Winnett loam and 30 percent Bone clay. Slopes are 4 to 8 percent. The Bone soil is in barren microdepressions, 8 to 10 inches below the level of the Winnett soil. The Bone soil in this complex has a profile similar to the one described as representative of the series, but shale bedrock is at a depth of 24 inches.

Runoff is medium, and the hazard of erosion is moderate. These soils are used for range, wildlife, and watershed. Capability unit VIe–1 dryland; Pan Spots range site, 10- to 14-inch precipitation zone; windbreak suitability group 3S.

Xavier Series

The Xavier series consists of deep, gently undulating to rolling, well-drained soils on fans, terraces, and high benches. Slopes range from 2 to 15 percent. These soils formed in silty alluvium and eolian sediment. Elevation ranges from 3,800 to 4,200 feet.

The native vegetation is mainly western wheatgrass, slender wheatgrass, green needlegrass, prairie junegrass, and big sagebrush. Annual precipitation is 15 to 16 inches, the average annual soil temperature is 45° to 47° F, and the frost-free period is 95 to 105 days.

In a representative profile the surface layer is grayish-brown silty clay loam and silt loam about 5 inches thick. The subsoil is dark-brown and pale-brown silty clay loam about 11 inches thick. The substratum is pale-yellow and light yellowish-brown silt loam that extends to a depth of 62 inches or more.

Permeability is moderate, and available water capacity is high. The effective rooting depth is 60 inches or more. These soils are used for dryfarmed and irrigated crops, range, wildlife, recreation, and watershed.

Representative profile of Xavier silty clay loam, undulating, in grassland, 2,000 feet north and 65 feet east of the center of sec. 18, T. 5 S., R. 33 E.

A11—0 to 3 inches, grayish-brown (10YR 5/2) light silty clay loam, dark brown (10YR 3/3) moist; weak, thin, platy structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine roots; many unstained silt and very fine sand grains; clear, smooth boundary.

A12—3 to 5 inches, grayish-brown (10YR 5/2) heavy silt loam, dark brown (10YR 3/3) moist; weak, fine, blocky structure; hard, friable, sticky and slightly plastic; many very fine roots; clear, smooth boundary.

B21t—5 to 10 inches, dark-brown (10YR 4/3) heavy silty clay loam, dark brown (10YR 3/3) moist; moderate, medium, prismatic structure parting to strong, blocky; very hard, firm, sticky and plastic; common very fine roots; many very fine pores; patchy clay films on peds; clear, smooth boundary.

B3—10 to 16 inches, pale-brown (10YR 6/3) silty clay loam, dark brown (10YR 4/3) moist; moderate, medium, prismatic structure parting to moderate, me-