United States
Department of
Agriculture

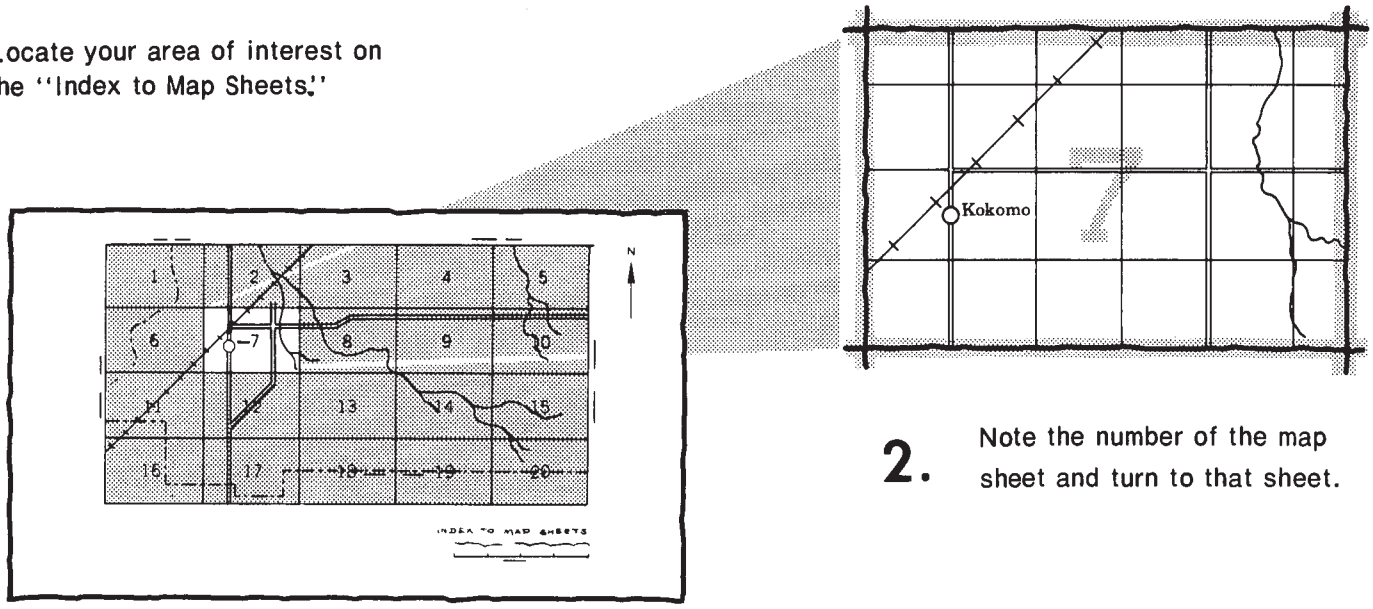
Soil
Conservation
Service

In cooperation with
United States Department
of Agriculture, Forest
Service; United States
Department of the Interior,
Bureau of Land Management;
and Montana Agricultural
Experiment Station

Soil Survey of Fergus County, Montana

HOW TO USE

1. Locate your area of interest on the "Index to Map Sheets."



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

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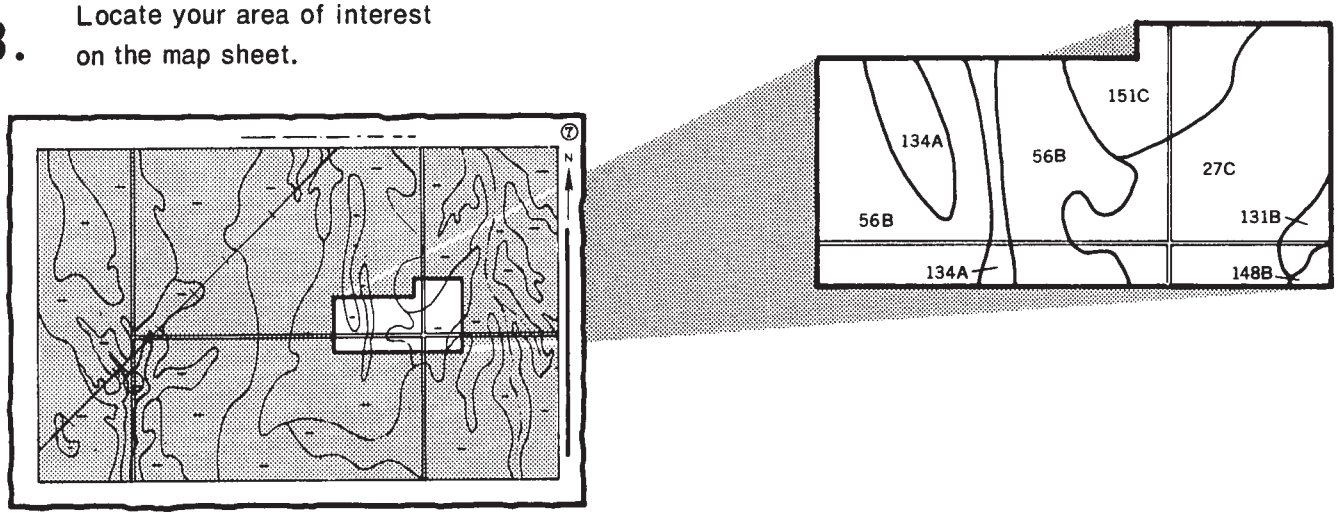

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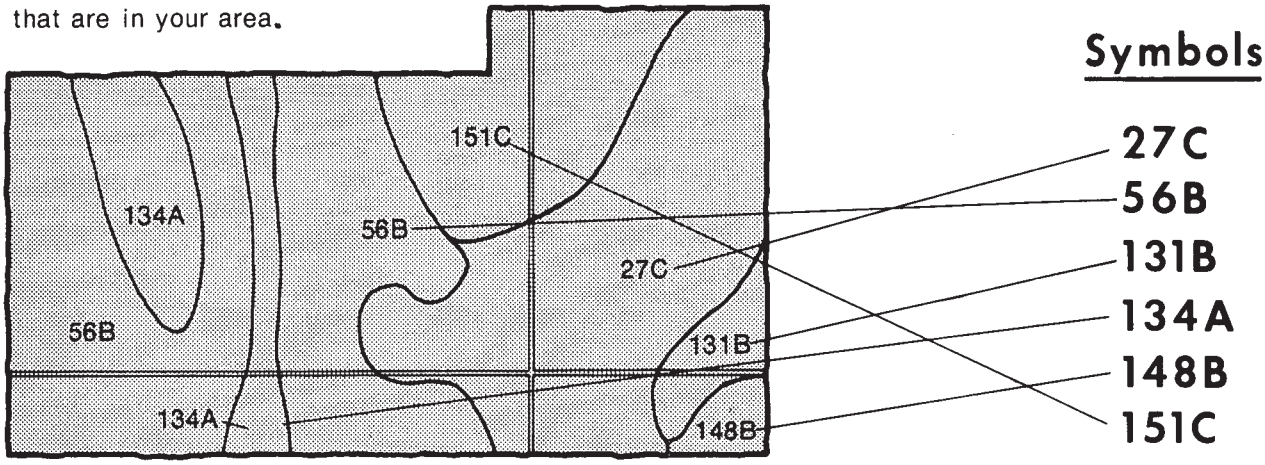
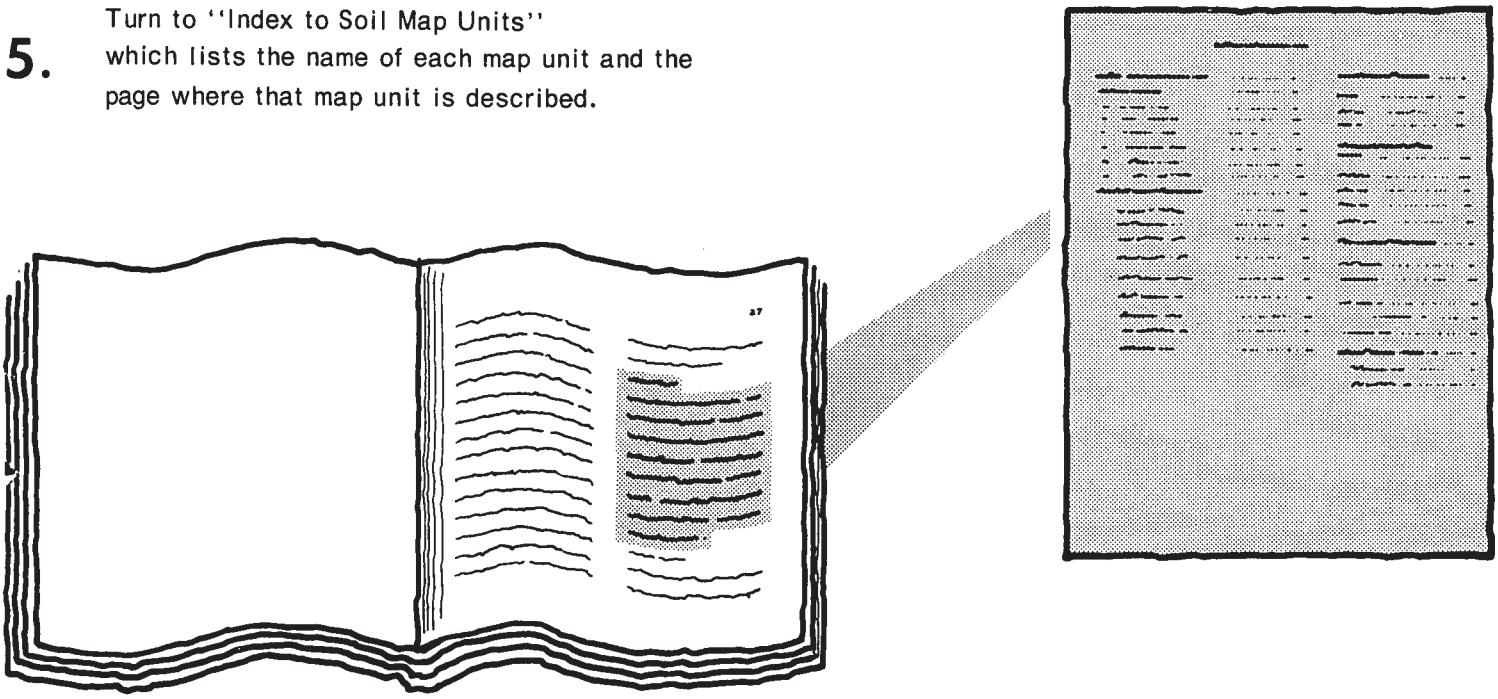
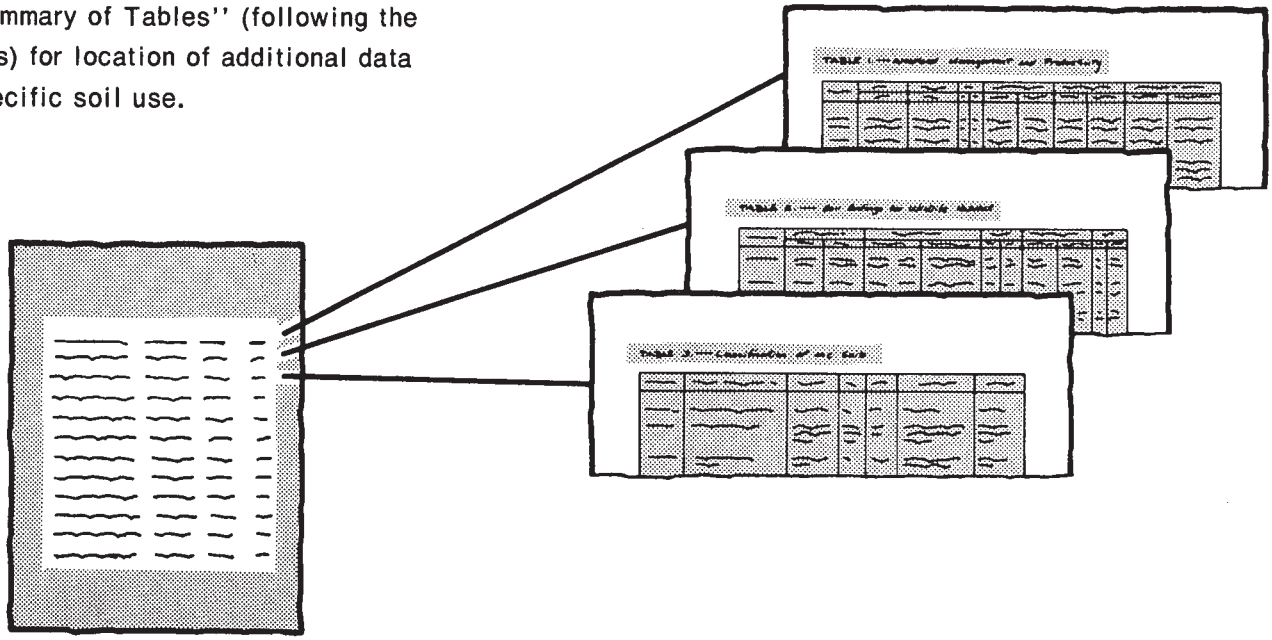


THIS SOIL SURVEY

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



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



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

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

This survey was made cooperatively by the Soil Conservation Service, the Forest Service, the Bureau of Land Management, and the Montana Agricultural Experiment Station. It is part of the technical assistance furnished to the Fergus County Conservation District. Major fieldwork for this soil survey was performed in the period 1960-78. Soil names and descriptions were approved in 1979. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1979.

Financial assistance was provided by the Old West Regional Commission in cooperation with the Montana Department of State Lands and by the Fergus County Commissioners.

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

Cover: Typical area of Fergus County. Savage silty clay loam, 0 to 2 percent slopes, in foreground.

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foreword

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

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

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

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the county is described. Information on specific uses is given for each soil. The information given in this survey does not eliminate the need for onsite investigation of the soils for specific uses. Help in using this publication and additional information are available at the local office of the Soil Conservation Service or the Cooperative Extension Service.

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State Conservationist
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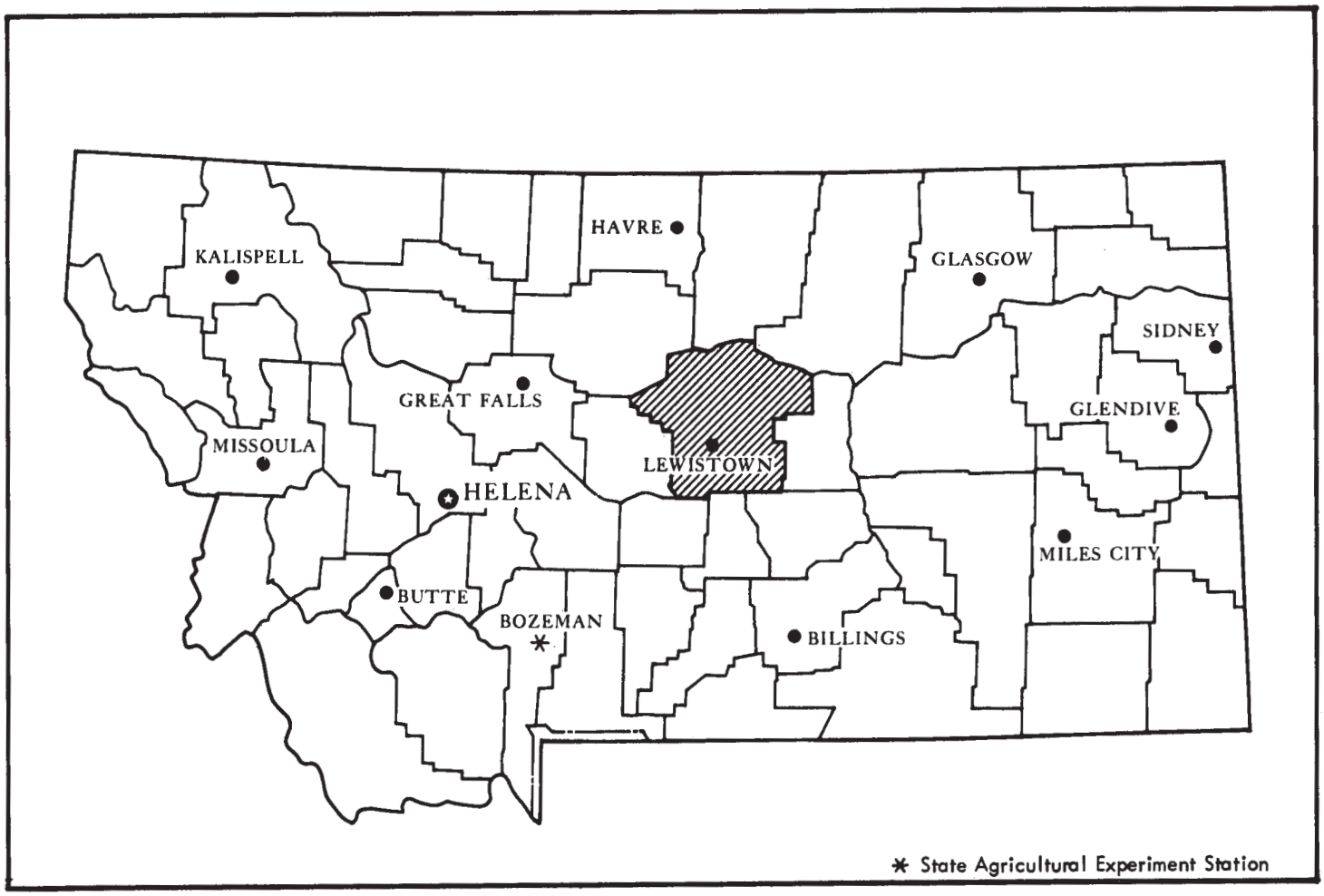

Location of Fergus County in Montana.

soil survey of
Fergus County, Montana

By Clair O. Clark, Soil Conservation Service

Fieldwork by Clair O. Clark, Laverne Gray, Ernest Hogan,
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United States Department of Agriculture, Soil Conservation Service
and Forest Service, United States Department of the Interior,
Bureau of Land Management, in cooperation with
Montana Agricultural Experiment Station

FERGUS COUNTY is in the central part of Montana. It has a total area of about 2,716,160 acres. Fergus County has a wide variety of topography that is characterized by rolling plains in the northern part of the county, the North and South Moccasin Mountains and the Judith Mountains in the central part, and the Big Snowy and Little Snowy Mountains in the southern part.

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

general nature of the survey area

This section briefly discusses the settlement and development, mineral resources, ground water resources, and climate of the survey area.

settlement and development

Fergus County was established by an act of the Fourteenth Legislative Assembly, Montana Territory, in spring of 1885. The original area of Fergus County was subsequently divided to form all or part of Musselshell, Petroleum, Judith Basin, Wheatland, and Golden Valley Counties and the present Fergus County.

The area that is now Fergus County once was largely the hunting grounds of such Indian tribes as the Gros Ventre, Crow, and Sioux. Trapping and trading with the Indians were the chief occupations up to the time that gold was discovered in the area.

In 1878 Mr. and Mrs. Janeaux filed the first homestead claim in the area that was to become Fergus County. In about 1880 stockmen began using the rangeland areas, but few crops were grown until about 1906. By 1917 most of the better farmland had been homesteaded. The number of farms has been decreasing steadily since 1930, when 2,073 farms were in the county. In 1974 the number of farms was only 802. As the number of farms has decreased, the average size of farms has increased from 609 acres in 1920 to 2,729 acres in 1974. In 1974 the county was about 62 percent rangeland, 25 percent cropland, 9 percent woodland, 2.5 percent pastureland, and about 1.5 percent other kinds of land.

mineral resources

By Eddie Juvan, geologist, Soil Conservation Service.

The mineral resources in the area can be divided into three groups: (1) metals; (2) fuels, consisting of oil and gas; and (3) nonmetallics, or industrial minerals.

All of the mineral deposits in Montana yielding commercial quantities of metal are in the mountainous areas, where igneous activity has been commonplace (*16*). Such is the case in Fergus County, where

commercial metallic deposits are associated with the laccoliths forming the Moccasin and Judith Mountains. Gold was produced in both localities in the early 1900's and again in the North Moccasins in the period 1936-42. Only a small amount of gold has been produced intermittently since that time. Almost all of the gold was produced from lode claims near intrusive contacts. Other metals associated with the intrusive bodies are silver, lead, zinc, copper, tungsten, and fluorite. Some of these are present in commercial quantities, and others occur as gangue minerals.

Although Fergus County is not one of Montana's leading oil- and gas-producing counties, several producing wells have been developed (*11*). As the search for oil and gas intensifies, many exploratory wells undoubtedly will be drilled in Fergus County. The only mineable coal reserve in the county is the Lewiston field, which ranges in depth, where mined, from 2.5 to 8.0 feet. Major exploitation of this field took place early in the 1900's. Only a few small mines are currently producing coal.

The nonmetallic, or industrial, minerals are probably more important to Fergus County than are the metals. Common brick clay is available in mineable quantities near Lewiston. High-quality, white-firing kaolin clay is available in the South Moccasin Mountains, but it is not mined because sufficient markets are too far away. Bentonite occurs in Cretaceous shale throughout the county. Deposits of commercially important gypsum are exposed near the base of the Ellis Formation, south of Lewistown. Building stone, limestone, travertine, and sand and gravel deposits are commercially mined in Fergus County.

ground water resources

By Eddie Juvan, geologist, Soil Conservation Service.

Most of Fergus County is underlain by stratified rock of Paleozoic and Mesozoic age. The rock contains a number of sandstone and limestone formations that are permeable and contain large quantities of ground water (*16*). Many of the water-bearing formations are exposed on the flanks of the mountains and therefore are favorably situated to receive recharge from precipitation and from streams flowing from the mountains. Other water-bearing formations are deeply buried and are some distance from the mountains. The geologic structure in areas of these formations is such that artesian wells can be dug in some areas.

Of great significance to the ground water supply of Fergus County are deposits on flood plains and low terraces along valleys. These deposits are composed principally of silt, sand, gravel, and cobbles, and they are the most permeable water-bearing strata in the county.

The consolidated rock of significance to the ground water supply is the stratified rock that underlies most of the areas that are not mountainous. Within the county, wells in the consolidated rock provide much of the water used for industrial and domestic purposes. Many water-bearing rock formations are in the county; because of the complexity of the geology, however, not all formations occur in any given area and the depth of wells required to tap a given formation varies with location.

Water quality tends to vary greatly because of differences in the content of dissolved solids. These variations depend mainly on the geology and precipitation in an area. The permeability and recharge characteristics of the rock in most of Fergus County are such that the water is contained longer, which allows more minerals to dissolve. Water quality generally decreases with depth.

The most important aquifers in Fergus County include the Fox Hills Sandstone, which is the lower member of the Hell Creek Formation, the Judith River Formation, the Eagle Sandstone, the Kootenai Formation, the Morrison Formation, the Swift Formation, and the Madison Limestone Group. The Sawtooth, Amsden, and Kibbey Formations also yield small supplies in certain areas. The Madison Limestone Group is essentially untapped, but it should be an important source of water in the future.

climate

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

Fergus County usually is warm in summer and is characterized by frequent hot days. In winter, periods of very cold weather are caused by artic air moving in from the north or northeast. Cold periods alternate with milder periods that often occur when westerly winds are warmed as they move downslope. Most precipitation falls as rain during the warmer part of the year and is usually heaviest late in spring and early in summer. Winter snowfalls are frequent, but the snow cover usually disappears during mild periods.

Table 1 gives data on temperature and precipitation in the survey area, as recorded at Denton, Grassrange, Lewistown, and Winifred, Montana. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter the average temperatures at Denton, Grassrange, Lewistown, and Winifred are 22, 25, 23, and 20 degrees F, respectively. The average daily minimum temperatures at Denton, Grassrange, Lewistown, and Winifred are 9, 11, 12, and 9 degrees, respectively. The lowest temperature occurred at Denton on December 29, 1968, and is -46 degrees. In summer the average temperature at Denton, Grassrange, Lewistown, and Winifred is 63, 65, 63, and 65 degrees, respectively. The average daily maximum temperature is about 80. The highest recorded temperature, which occurred at

Grassrange on August 5, 1961, and at Winifred on August 24, 1969, is 105 degrees.

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

The total annual precipitation at the four reporting weather stations is 14 to 17 inches. The total annual precipitation for the county is 10 to 30 inches. Of the total precipitation, 75 percent usually falls April through September, which includes the growing season for most crops. The heaviest 1-day rainfall during the period of record was 2.9 inches at Winifred on May 21, 1962. Thunderstorms occur on about 30 days each year, and most occur in summer.

The average seasonal snowfall is 53 inches at Denton, 66 inches at Grassrange, 61 inches at Lewistown, and 41 inches at Winifred. The greatest snow depth at any one time during the period of record was 36 inches at Denton, 20 inches at Grassrange, and 22 inches at both Lewistown and Winifred. On the average, 25 days at Denton, 18 days at Grassrange, 53 days at Lewistown, and 27 days at Winifred have at least 1 inch of snow on the ground, but the number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 50 percent. Humidity is higher at night, and the average at dawn is about 70 percent. The percentage of possible sunshine is 75 in summer and 50 in winter. The prevailing wind is from the southwest. Average windspeed is highest, 12 miles per hour, in spring.

In some winters a heavy blizzard with high winds and drifting snow strikes the area, and snow remains on the ground for many weeks. In some years summer hailstorms cause severe local damage to crops in the area.

how this survey was made

Soil scientists made this survey to learn what soils are in the survey area, where they are, and how they can be used. They observed the steepness, length, and shape of slopes; the size of streams and the general pattern of drainage; the kinds of native plants or crops; and the kinds of rock. They dug many holes to study soil profiles. A profile is the sequence of natural layers, or horizons, in a soil. It extends from the surface down into the parent material, which has been changed very little by leaching or by plant roots.

The soil scientists recorded the characteristics of the profiles they studied and compared those profiles with others in nearby counties and in more distant places. They classified and named the soils according to nationwide uniform procedures. They drew the boundaries of the soils on aerial photographs. These photographs show trees, buildings, fields, roads, and other details that help in drawing boundaries accurately. The soil maps at the back of this publication were prepared from aerial photographs.

The areas shown on a soil map are called map units. Most map units are made up of one kind of soil. Some are made up of two or more kinds. The map units in this survey area are described under "General soil map units" and "Detailed soil map units."

While a soil survey is in progress, samples of some soils are taken for laboratory measurements and for engineering tests. All soils are field tested to determine their characteristics. Interpretations of those characteristics may be modified during the survey. Data are assembled from other sources, such as test results, records, field experience, and state and local specialists. For example, data on crop yields under defined management are assembled from farm records and from field or plot experiments on the same kinds of soil.

But only part of a soil survey is done when the soils have been named, described, interpreted, and delineated on aerial photographs and when the laboratory data and other data have been assembled. The mass of detailed information then needs to be organized so that it can be used by farmers, rangeland and woodland managers, engineers, planners, developers and builders, home buyers, and others.

general soil map units

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

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

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

The 20 general map units in this survey have been grouped into five general kinds of landscape for broad interpretative purposes. Each of the broad groups and the map units in each group are described in the following pages.

soils on flood plains and low terraces

This group consists of one map unit. It makes up about 3 percent of the county. The soils in this group are nearly level. Elevation is 2,200 to 4,600 feet. The average annual precipitation is 10 to 20 inches, the average annual air temperature is 40 to 45 degrees F, and the average frost-free season is 100 to 135 days.

The soils in this group are deep and are somewhat poorly drained and well drained. They formed in alluvium derived from mixed rock sources.

This group is used mainly for irrigated and nonirrigated hay and pasture. It is also used as rangeland and for nonirrigated crops, woodland, and wildlife habitat.

1. Marcott-Harlem-Frazer

Deep, somewhat poorly drained and well drained, nearly level soils; on flood plains and low terraces

This map unit is along major drainageways throughout the county. The unit is characterized by meandering channels that dissect the flood plains. Slope is 0 to 2 percent. Elevation is 2,200 to 4,600 feet. The average annual precipitation is 10 to 20 inches, the average annual air temperature is 40 to 45 degrees F, and the average frost-free season is 100 to 135 days.

This unit makes up about 3 percent of the survey area. It is about 25 percent Marcott soils, 20 percent Harlem soils, and 15 percent Frazer soils. The remaining 40 percent is components of minor extent.

Marcott soils are on flood plains and low terraces in the 15- to 20-inch precipitation zone. These soils are deep and somewhat poorly drained. They formed in alluvium derived from mixed rock sources. The surface layer is silty clay loam, and the subsoil is silty clay. The upper part of the substratum is silty clay and clay, and the lower part, below a depth of about 42 inches, is extremely gravelly sandy clay loam. A seasonal high water table is at a depth of 24 to 36 inches in spring.

Harlem soils are on flood plains and low terraces in the 10- to 14-inch precipitation zone. These soils are deep and well drained. They formed in alluvium derived from mixed rock sources. The surface layer is silty clay loam. The upper part of the underlying material is clay loam, and the lower part is mainly silty clay loam that is stratified with silty clay and silt loam.

Frazer soils are on flood plains and low terraces in the 15- to 19-inch precipitation zone. These soils are deep and well drained. They formed in alluvium derived from mixed rock sources. The surface layer is silty clay loam, and the underlying material is silty clay loam and silty clay.

Of minor extent in this unit are Havre, Korchea, Nesda, Adger, Daglum, Linwell, Sudworth, Kobar, Enbar, and Richey soils on fans, flood plains, and terraces. Enbar soils are somewhat poorly drained; Adger and Daglum soils are moderately well drained and are salt- and alkali-affected; and the other minor soils are well drained.

This unit is used mainly for irrigated and nonirrigated hay and pasture. It is also used as rangeland and for nonirrigated crops, woodland, and wildlife habitat.

This unit has potential for providing habitat for white-tailed deer, mule deer, ring-necked pheasant, gray partridge, sharp-tailed grouse, and sage grouse.

The main limitations of this unit for homesite development are a hazard of flooding and a fluctuating high water table.

Soils mainly on terraces and along the edges of terraces

This group consists of five map units. It makes up about 15.5 percent of the survey area. The soils in this group are nearly level to steep. Elevation is 2,400 to 5,300 feet. The average annual precipitation is 10 to 24 inches, the average annual air temperature is 40 to 45 degrees F, and the average frost-free season is 90 to 135 days.

The soils in this group are moderately deep and deep and are well drained. They formed in alluvium and residuum derived dominantly from limestone and shale.

This group is used mainly for nonirrigated crops. It is also used as rangeland, for hay and pasture, and for wildlife habitat.

2. Crago-Abor-Sanje

Moderately deep to deep, well drained, nearly level to steep soils; on uplands, terraces, and fans and along the edges of terraces

This map unit is in the southeastern part of the county. The unit is characterized by high terraces and gravel terrace edges. Slope is 0 to 45 percent. Elevation is 2,400 to 4,500 feet. The average annual precipitation is 10 to 14 inches, the average annual air temperature is 42 to 45 degrees F, and the average frost-free season is 115 to 135 days.

This unit makes up about 0.5 percent of the survey area. It is about 30 percent Crago soils and similar soils, 30 percent Abor soils, and 25 percent Sanje soils. The remaining 15 percent is components of minor extent.

Crago soils and similar soils are on terraces, along the edges of terraces, and on fans. These soils are deep and well drained. They formed in alluvium derived dominantly from limestone. They are very gravelly or extremely gravelly throughout.

Abor soils are on uplands. These soils are moderately deep and well drained. They formed in residuum and alluvium derived dominantly from semiconsolidated shale. They are mainly silty clay and are underlain by shale at a depth of about 30 inches.

Sanje soils are on terraces and fans. These soils are deep and well drained. They formed in alluvium derived dominantly from shale and limestone. They have a clay loam surface layer and a clay subsoil that is underlain by an extremely gravelly sandy loam substratum at a depth of about 30 inches.

Of minor extent in this unit are Ashuelot Variant, Yawdim, and Thebo soils. The Ashuelot Variant soils are on terraces and have a lime-cemented layer of gravel at a depth of 15 to 20 inches. The shallow Yawdim soils and the moderately deep Thebo soils are on uplands and are underlain by shale.

This unit is used mainly as rangeland. It is also used for hay and pasture, nonirrigated crops, and wildlife habitat.

This unit has potential for providing habitat for mule deer, pronghorn antelope, and sage grouse.

The main limitations of this unit for homesite development are the moderately steep and steep slopes and the content of rock fragments in the Crago soils; the clay subsoil that extends to a depth of about 30 inches, shrink-swell potential, and low strength of the Sanje soils; and the slow permeability, moderate depth to shale, shrink-swell potential, and low strength of the Abor soils.

3. Danvers-Fairfield

Deep, well drained, nearly level to moderately sloping soils; on terraces

This map unit is in the northwestern part of the county. It is mainly on terraces. Slope is 0 to 8 percent. Elevation is 3,500 to 4,200 feet. The average annual precipitation is 15 to 19 inches, the average annual air temperature is 40 to 45 degrees F, and the average frost-free season is 110 to 125 days.

This unit makes up about 3 percent of the survey area. It is about 50 percent Danvers soils and 20 percent Fairfield soils. The remaining 30 percent is components of minor extent.

Danvers soils formed in alluvium derived dominantly from limestone. The surface layer is clay loam. The subsoil is silty clay and clay. The upper part of the substratum is clay and clay loam, and the lower part is gravelly clay loam.

Fairfield soils formed in alluvium derived dominantly from limestone. The surface layer is clay loam. The subsoil and upper part of the substratum are silty clay loam. The lower part of the substratum is very gravelly clay loam.

Of minor extent in this unit are deep, well drained Judell, Martinsdale, Acel, Judith, and Tamaneen soils. These soils are on terraces, fans, and foot slopes.

This unit is used mainly for nonirrigated crops. It is also used as rangeland and for hay and pasture and wildlife habitat.

This unit has potential for providing habitat for mule deer, pronghorn antelope, sharp-tailed grouse, gray partridge, and ring-necked pheasant.

The main limitations of this unit for homesite development are restricted permeability, shrink-swell potential, and low soil strength.

4. Doughty-Judith-Sipple

Deep, well drained, nearly level to strongly sloping soils; on terraces and fans

This map unit is in the southwestern part of the county. Slope is 0 to 15 percent. Elevation is 3,200 to 4,800 feet. The average annual precipitation is 15 to 24 inches, the average annual air temperature is 40 to 45 degrees F, and the average frost-free season is 90 to 125 days.

This unit makes up about 3 percent of the survey area. It is about 25 percent Doughty soils, 25 percent Judith soils, and 10 percent Sipple soils. The remaining 40 percent is components of minor extent.

Doughty soils are on terraces and fans. They formed in alluvium derived dominantly from limestone. The surface layer is loam. The subsoil and upper part of the substratum are clay loam. The lower part of the substratum is mainly extremely gravelly sandy clay loam.

Judith soils are on terraces and fans. They formed in alluvium derived dominantly from limestone. The surface layer is gravelly clay loam, the subsoil is clay loam, and the substratum is extremely gravelly loam and extremely gravelly sandy clay loam.

Sipple soils are on terraces. They formed in alluvium derived dominantly from limestone. The surface layer is loam. The upper part of the subsoil is clay loam, and the lower part is loam and silty clay loam. The upper part of the substratum is silty clay loam, and the lower part is very gravelly loam.

Of minor extent in this unit are Windham, Straw, Enbar, Winifred, Marcott, and Ashuelot Variant soils. The Ashuelot Variant soils have a layer of lime-cemented gravel between depths of 15 and 20 inches. The Enbar and Marcott soils are somewhat poorly drained and are on flood plains and terraces. The Winifred soils are moderately deep over shale. The deep, well drained Straw soils are on terraces, fans, and flood plains. The Windham soils are mainly on terraces and have very gravelly or extremely gravelly material below a depth of about 12 inches.

This unit is used mainly for nonirrigated crops. It is also used for hay and pasture, rangeland, and wildlife habitat.

This unit has potential for providing habitat for mule deer, pronghorn antelope, sharp-tailed grouse, gray partridge, and ring-necked pheasant.

The main limitations of this unit for homesite development are content of rock fragments, potential frost action, and low soil strength.

5. Tamaneen-Judith-Windham

Deep, well drained, nearly level to steep soils; on terraces, edges of terraces, and fans

This map unit is mainly in the western part of the county. Slope is 0 to 45 percent. Elevation is 3,200 to 5,200 feet. The average annual precipitation is 15 to 20 inches, the average annual air temperature is 40 to 45 degrees F, and the average frost-free season is 90 to 125 days.

This unit makes up about 6 percent of the survey area. It is about 30 percent Tamaneen soils, 25 percent Judith soils, and 15 percent Windham soils. The remaining 30 percent is components of minor extent.

Tamaneen soils are on terraces and fans. They formed in alluvium derived dominantly from limestone. They have a clay loam surface layer, a silty clay and clay loam subsoil, and a very gravelly loam and extremely gravelly sandy loam substratum.

Judith soils are on terraces and fans. They formed in alluvium derived dominantly from limestone. They have a gravelly clay loam surface layer, a clay loam subsoil, and an extremely gravelly loam and extremely gravelly sandy clay loam substratum.

Windham soils are on terraces, edges of terraces, and fans. They formed in alluvium derived dominantly from limestone. They have a gravelly clay loam surface layer and subsoil and a very gravelly loam or extremely gravelly loam substratum.

Of minor extent in this unit are Judell, Winifred, Korchea, Enbar, Straw, Martinsdale, Marcott, and Ashuelot Variant soils. The Winifred soils are moderately deep over shale. The Korchea soils are on flood plains. The somewhat poorly drained Enbar and Marcott soils are on flood plains and terraces. The Ashuelot Variant soils have a layer of lime-cemented gravel between depths of 15 and 20 inches. The deep, well drained Judell and Martinsdale soils do not have an extremely gravelly substratum within 40 inches of the surface. The Straw soils are on flood plains, terraces, and fans.

This unit is used mainly for nonirrigated crops. It is also used for hay and pasture, rangeland, and wildlife habitat.

This unit has potential for providing habitat for mule deer, pronghorn antelope, sharp-tailed grouse, gray partridge, and ring-necked pheasant.

The main limitations of this unit for homesite development are moderately steep and steep slopes, potential frost action, and the low strength of the soil material above the extremely gravelly substratum.

6. Roy-Winifred

Moderately deep and deep, well drained, nearly level to steep soils; mainly on terraces, fans, and uplands

This map unit is in the east-central part of the county. Slope is 0 to 45 percent. Elevation is 2,700 to 5,300 feet. The average annual precipitation is 15 to 19 inches, the average annual air temperature is 40 to 45 degrees F, and the average frost-free season is 105 to 125 days.

This unit makes up about 3 percent of the survey area. It is about 40 percent Roy soils and 20 percent Winifred soils. The remaining 40 percent is components of minor extent.

Roy soils are on terraces, fans, and foot slopes. These soils are deep and well drained. They formed in alluvium derived from mixed rock sources. The surface layer is mainly very stony clay loam, the subsoil is very cobbly clay loam, and the substratum is extremely cobbly clay loam.

Winifred soils are on uplands. These soils are moderately deep and well drained. They formed in local alluvium and residuum derived dominantly from

semiconsolidated shale. They have a clay loam surface layer and a clay loam, silty clay, and clay subsoil that is underlain by shale at a depth of about 32 inches.

Of minor extent in this unit are Lolo, Tamaneen, Norbert, Eltsac, Adger, Marcott, and Frazer soils. The Lolo, Tamaneen, and Adger soils are on fans and terraces. The Norbert and Eltsac soils are underlain by shale. The somewhat poorly drained Marcott soils are on flood plains and terraces. The Frazer soils are on flood plains near drainageways. The Adger soils are affected by salt and alkali.

This unit is used mainly as rangeland. It is also used for hay and pasture, nonirrigated crops, and wildlife.

This unit has potential for providing habitat for mule deer, white-tailed deer, ring-necked pheasant, gray partridge, sharp-tailed grouse, and ruffed grouse.

The main limitations of this unit for homesite development are the areas where slopes are moderately steep and steep, moderate depth to shale, shrink-swell potential, and content of rock fragments.

Soils on uplands

This group consists of 10 map units. It makes up about 61.5 percent of the county. The soils in this group are nearly level to very steep. Elevation is 2,200 to 4,800 feet. The average annual precipitation is 10 to 19 inches, the average annual air temperature is 40 to 45 degrees F, and the average frost-free season is 100 to 135 days.

The soils in this group are shallow to deep and are well drained, moderately well drained, and somewhat excessively drained. They formed in residual, alluvial, and eolian material derived dominantly from shale, sandstone, and siltstone.

This group is used mainly as rangeland. It is also used for hay and pasture, nonirrigated crops, woodland, and wildlife habitat.

7. Julin-Ernem-Tanna

Shallow and moderately deep, well drained, undulating to moderately steep soils; on uplands

This map unit is in the southeastern part of the county. Slope is 2 to 25 percent. Elevation is 2,200 to 3,800 feet. The average annual precipitation is 10 to 14 inches, the average annual air temperature is 42 to 45 degrees F, and the average frost-free season is 115 to 135 days.

This unit makes up about 2 percent of the survey area. It is about 25 percent Julin soils, 15 percent Ernem soils, and 10 percent Tanna soils. The remaining 50 percent is components of minor extent.

Julin soils are moderately deep and well drained. They formed in residuum derived dominantly from consolidated acid shale. They have a surface layer and underlying material of silty clay. Shale is at a depth of about 30 inches.

Ernem soils are shallow and well drained. They formed in residuum derived dominantly from hard sandstone. The surface layer is mainly clay loam, and the subsoil is very channery clay and extremely channery clay. Sandstone is at a depth of about 14 inches.

Tanna soils are moderately deep and well drained. They formed in residuum derived dominantly from semiconsolidated shale interbedded with sandstone. The surface layer is silty clay loam, the subsoil is silty clay and silty clay loam, and the substratum is silty clay loam. Shale and sandstone are at a depth of about 32 inches.

Of minor extent in this unit are Neldore, Teigen, Delplain, Cabston, Welter, Dilts, Gerdrum, Weingart, Creed, Thebo, and Syblon soils. The shallow Delplain, Dilts, and Neldore soils and the moderately deep Syblon, Thebo, Weingart, and Welter soils are on uplands. The Welter soils are forested. The Creed, Gerdrum, and Teigen soils are on fans and terraces. The substratum of the Creed and Gerdrum soils is affected by salt and alkali. The Cabston soils are on foot slopes and fans.

This unit is used mainly as rangeland. It is also used for hay and pasture, nonirrigated crops, woodland, and wildlife habitat.

This unit has potential for providing habitat for pronghorn antelope, mule deer, white-tailed deer, and sage grouse.

The main limitations of this unit for homesite development are moderately steep slopes, shallow and moderate depth to shale and sandstone, shrink-swell potential, and low soil strength.

8. Thebo-Neldore

Shallow and moderately deep, well drained, gently sloping to very steep soils; on uplands and foot slopes

This map unit is in the northeastern part of the county (fig. 1). Slope is 2 to 60 percent. Elevation is 2,200 to 4,500 feet. The average annual precipitation is 10 to 14 inches, the average annual air temperature is 42 to 45 degrees F, and the average frost-free season is 115 to 135 days.

This unit makes up about 17.5 percent of the survey area. It is about 35 percent Thebo soils and 15 percent Neldore soils. The remaining 50 percent is components of minor extent.

Thebo soils are on uplands and foot slopes. These soils are moderately deep and well drained. They formed in residuum derived dominantly from semiconsolidated shale. They have a clay surface layer and clay underlying material. Shale is at a depth of about 33 inches.

Neldore soils are on uplands. These soils are shallow and well drained. They formed in residuum derived dominantly from consolidated shale. They have a clay surface layer and clay and extremely shaly clay underlying material. Shale is about 18 inches deep.

Figure 1.—Typical area of general soil map unit 8.

Of minor extent in this unit are Gerdrum, Marvan, Vanda, Havre, Harlem, Absher, Dilts, Julin, Nobe, Pendroy, and Weingart soils. The salt- and alkali-affected Gerdrum, Marvan, Nobe, and Vanda soils are on terraces and fans. The Havre and Harlem soils are on flood plains and terraces. The moderately well drained, salt- and alkali-affected Absher soils are on terraces and fans. The moderately deep Julin and Weingart soils are on shale uplands. The shallow, well drained Dilts soils are on shale ridges.

This unit is used mainly as rangeland. It is also used for hay and pasture, nonirrigated crops, and wildlife habitat.

This unit has potential for providing habitat for pronghorn antelope, mule deer, sharp-tailed grouse, and sage grouse.

The main limitations of this unit for homesite development are moderately steep to very steep slopes, shallow and moderate depths to shale, shrink-swell potential, and low soil strength.

9. Eltsac-Lawther-Wayden

Shallow to deep, well drained, nearly level to very steep soils; on uplands, fans, and terraces

This map unit is in the northwestern part of the county. Slope is 0 to 60 percent. Elevation is 3,200 to 4,500 feet. The average annual precipitation is 14 to 19 inches, the average annual air temperature is 40 to 45 degrees F, and the average frost-free season is 110 to 125 days.

This unit makes up about 5 percent of the survey area. It is about 30 percent Eltsac soils, 10 percent Lawther soils, and 10 percent Wayden soils. The remaining 50 percent is components of minor extent.

Eltsac soils are on uplands. These soils are moderately deep and well drained. They formed in residuum derived dominantly from semiconsolidated shale. They have a clay surface layer. The underlying material is mainly clay. Shale is at a depth of about 38 inches.

Lawther soils are on terraces and fans. These soils are deep and well drained. They formed in alluvium derived dominantly from shale. They have a silty clay surface layer and subsoil and a clay substratum.

Wayden soils are on uplands. These soils are shallow and well drained. They formed in residuum derived dominantly from semiconsolidated shale. They have a silty clay loam surface layer. The underlying material is silty clay loam and silty clay. Shale is at a depth of about 16 inches.

Of minor extent in this unit are Norbert, Linwell, Savage, Winifred, Work, Adger, Daglum, and Turner soils and Rock outcrop. The shallow Norbert soils and moderately deep Winifred soils are on shale uplands. The deep, well drained Linwell, Savage, and Work soils are on terraces and fans. The moderately well drained, salt- and alkali-affected Adger and Daglum soils are on terraces and fans. Rock outcrop is on steep and very steep side slopes and on ridges.

This unit is used mainly for nonirrigated crops. It is also used as rangeland and for hay and pasture and wildlife habitat.

This unit has potential for providing habitat for mule deer, pronghorn antelope, sharp-tailed grouse, gray partridge, and ring-necked pheasant.

The main limitations of this unit for homesite development are moderately steep to very steep slopes,

shallow and moderate depths to shale, shrink-swell potential, and low soil strength.

10. Gerber-Lawther-Wayden

Shallow and deep, well drained, nearly level to very steep soils; on terraces, fans, foot slopes, and uplands

This map unit is in the northwestern part of the county. Slope is 0 to 60 percent. Elevation is 3,200 to 4,200 feet. The average annual precipitation is 14 to 19 inches, the average annual air temperature is 40 to 45 degrees F, and the average frost-free season is 110 to 125 days.

This unit makes up about 2 percent of the survey area. It is about 30 percent Gerber soils, 10 percent Lawther soils, and 10 percent Wayden soils. The remaining 50 percent is components of minor extent.

Gerber soils are on terraces, fans, and foot slopes. These soils are deep and well drained. They formed in alluvium derived dominantly from shale. They have a clay loam surface layer, a silty clay subsoil, and a silty clay substratum.

Lawther soils are on terraces and fans. These soils are deep and well drained. They formed in alluvium derived dominantly from shale. They have a silty clay surface layer and subsoil and a clay substratum.

Wayden soils are on uplands. These soils are shallow and well drained. They formed in residuum derived dominantly from semiconsolidated shale. They have a silty clay loam surface layer. The underlying material is silty clay loam and silty clay. Shale is at a depth of about 16 inches.

Of minor extent in this unit are Savage, Marcott, Linwell, Acel, Danvers, Fairfield, and Winifred soils. The well drained Acel, Savage, Danvers, Fairfield, and Linwell soils are on terraces and fans. The somewhat poorly drained Marcott soils are on flood plains, terraces, and fans. The moderately deep Winifred soils are on uplands and are underlain by shale.

This unit is used mainly for nonirrigated crops and hay and pasture. It is also used as rangeland and for wildlife habitat.

This unit has potential for providing habitat for mule deer, white-tailed deer, gray partridge, ring-necked pheasant, and sharp-tailed grouse.

The main limitations of this unit for homesite development are moderately steep to very steep slopes, shallow depth to shale in the Wayden soils, shrink-swell potential, and low soil strength.

11. Thebo-Gerdrum-Absher

Moderately deep and deep, well drained and moderately well drained, nearly level to steep soils; on uplands, terraces, fans, and foot slopes

This map unit is in the eastern part of the county. Slope is 0 to 45 percent. Elevation is 2,200 to 4,500 feet. The average annual precipitation is 10 to 14 inches, the average annual air temperature is 42 to 45 degrees F, and the average frost-free season is 115 to 135 days.

This unit makes up about 7 percent of the survey area. It is about 25 percent Thebo soils, 20 percent Gerdrum soils, and 10 percent Absher soils. The remaining 45 percent is components of minor extent.

Thebo soils are on uplands. These soils are moderately deep and well drained. They formed in residuum derived dominantly from semiconsolidated shale. They have a clay surface layer and clay underlying material. Shale is at a depth of about 33 inches.

Gerdrum soils are on terraces, fans, and foot slopes. These soils are deep, well drained, and salt- and alkali-affected. They formed in alluvium derived from mixed rock sources. They have a clay loam surface layer, a clay subsoil, and a silty clay substratum.

Absher soils are on terraces, fans, and uplands. These soils are deep and moderately well drained and are strongly affected by salt and alkali. They formed in alluvium derived dominantly from shale. They have a clay loam surface layer, a clay subsoil, and a clay and silty clay substratum.

Of minor extent in this unit are Weingart, Creed, Verson, Neldore, Klayent, Harlem, Vanda, Marvan, Evanston, Ethridge, and Nobe soils. The Absher, Creed, Klayent, Marvan, Nobe, Vanda, and Weingart soils are all affected by salt and alkali. The shallow Neldore soils are on shale uplands. The Harlem soils are on flood plains. The deep, well drained Ethridge and Evanston soils are on terraces and fans. The Verson soils are underlain by extremely gravelly or very gravelly material at a depth of 18 to 36 inches.

This unit is used mainly as rangeland. It is also used for hay and pasture, nonirrigated crops, and wildlife habitat.

This unit has potential for providing habitat for mule deer, white-tailed deer, pronghorn antelope, sage grouse, and sharp-tailed grouse.

The main limitations of this unit for homesite development are moderately steep and steep slopes, restricted permeability, salinity, shrink-swell potential, low soil strength, and moderate depth to shale in the Thebo soils.

12. Neldore-Rock outcrop-Dilts

Shallow, well drained, gently sloping to very steep soils, and Rock outcrop; on uplands

This map unit is mostly in the northern part of the county. It is mainly in deeply dissected areas along the Missouri River, Judith River, and Arrow Creek (fig. 2). Slope is 4 to 60 percent. Elevation is 2,200 to 3,800 feet. The average annual precipitation is 10 to 14 inches, the average annual air temperature is 42 to 45 degrees F, and the average frost-free season is 115 to 135 days.

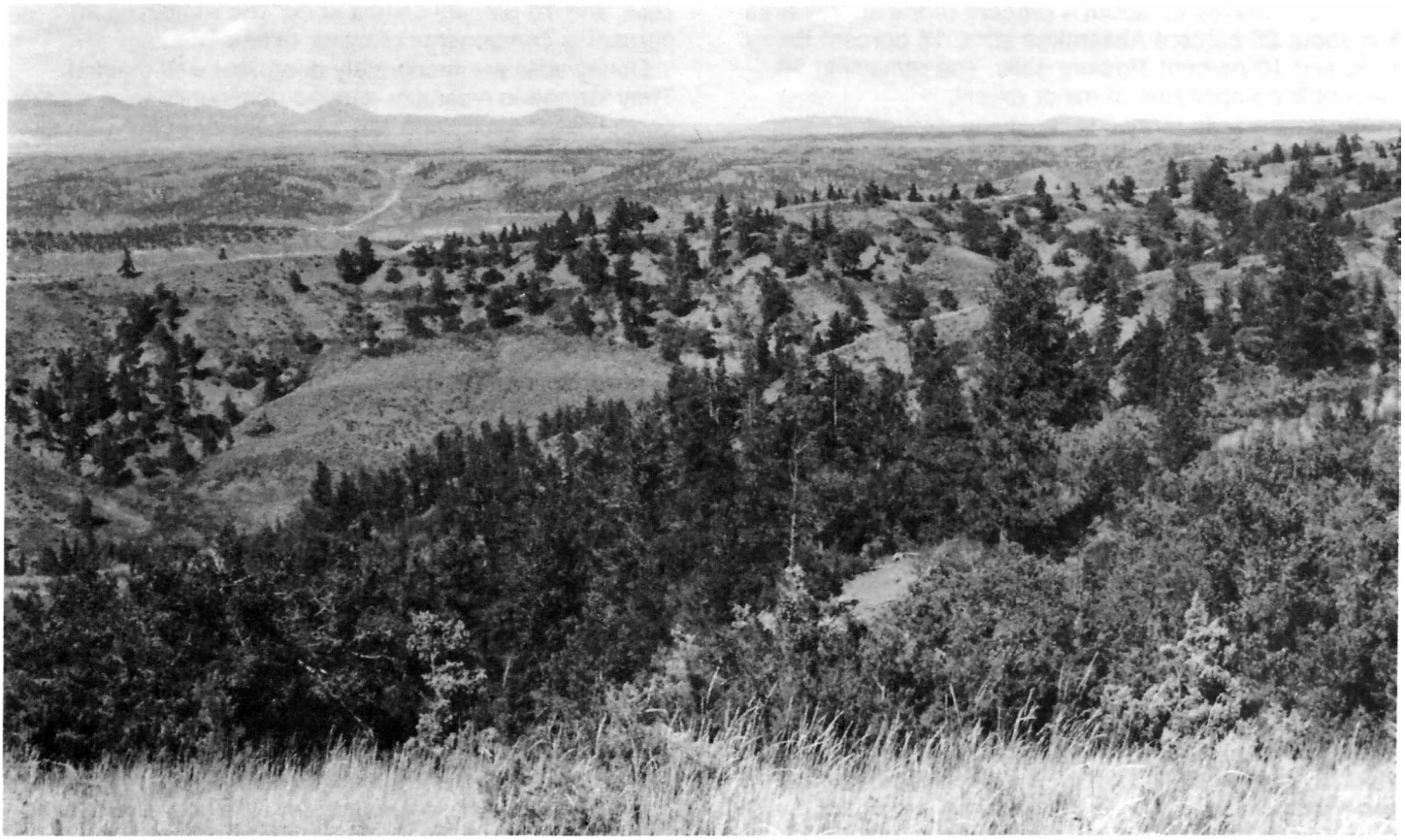

Figure 2.—Typical area of general soil map unit 12 along the Missouri River Breaks. The areas of woodland are mainly on north-facing side slopes.

This unit makes up about 15 percent of the survey area. It is about 20 percent Neldore soils, 20 percent Rock outcrop, and 15 percent Dilts soils. The remaining 45 percent is components of minor extent.

Neldore soils formed in residuum derived dominantly from consolidated shale. They have a clay surface layer and clay and extremely shaly clay underlying material. Shale is at a depth of about 18 inches.

Rock outcrop is mainly shale outcroppings along deeply dissected drainageways and on steep to very steep hillsides.

Dilts soils formed in residuum derived dominantly from consolidated acid shale. They have a clay surface layer and underlying material. Shale is at a depth of about 15 inches.

Of minor extent in this unit are Julin, Thebo, Marvan, Vanda, Marias, Gerdrum, Absher, Harlem, Havre, Norbert, Cabbart, and Pendroy soils. The moderately deep Julin and Thebo soils are on shale uplands. The deep Gerdrum, Marias, Marvan, Pendroy, Absher, and Vanda soils are on fans and terraces. The Gerdrum, Marvan, Absher, and Vanda soils are affected by salt and alkali. The deep Harlem and Havre soils are on flood plains. The shallow Cabbart and Norbert soils are on uplands.

This unit is used mainly as rangeland. It is also used as woodland, for nonirrigated hay and pasture, and for wildlife habitat.

This unit has potential for providing habitat for mule deer, white-tailed deer, Rocky Mountain elk, and Merriam's turkey.

The main limitations of this unit for homesite development are moderately steep to very steep slopes, clayey soil texture, shallow depth to shale, shrink-swell potential, low soil strength, and the Rock outcrops.

13. Absarokee-Borky-Timberg

Moderately deep, well drained, gently sloping to steep soils; on uplands

This map unit is in the southeastern part of the county. Slope is 2 to 45 percent. Elevation is 3,000 to 4,800 feet. The average annual precipitation is 15 to 19 inches, the average annual air temperature is 40 to 45 degrees F, and the average frost-free season is 100 to 125 days.

This unit makes up about 4 percent of the survey area. It is about 25 percent Absarokee soils, 15 percent Borky soils, and 10 percent Timberg soils. The remaining 50 percent is components of minor extent.

Absarokee soils formed in residuum derived dominantly from consolidated shale interbedded with sandstone. They have a clay loam surface layer, a silty clay and clay loam subsoil, and a clay loam substratum. Shale and sandstone are at a depth of about 26 inches.

Borky soils formed in residuum derived dominantly from consolidated sandstone interbedded with shale. They have a very stony loam surface layer, a very stony clay and very stony clay loam subsoil, and a very stony clay loam substratum. Sandstone and shale are at a depth of about 36 inches.

Timberg soils formed in residuum derived dominantly from semiconsolidated shale interbedded with sandstone. They have a clay loam surface layer, a silty clay subsoil, and a silty clay substratum. Shale and sandstone are at a depth of about 37 inches.

Of minor extent in this unit are Sinnigam, Castner, Darret, Bitton, Labre, Fergus, Twin Creek, Amherst, Mocmont, Windham, and Ashuelot Variant soils. The shallow Amherst, Castner, and Sinnigam soils are on uplands. The Ashuelot Variant soils have a layer of lime-cemented gravel between depths of 15 and 20 inches. The moderately deep Darret soils are derived from reddish shale and sandstone. The deep Bitton, Labre, and Windham soils are on fans, terraces, and foot slopes. These soils have many rock fragments throughout the profile. The deep Fergus and Twin Creek soils are on fans and terraces. The deep Mocmont soils are on forested mountainsides and uplands. They contain many angular fragments of sandstone.

This unit is used mainly as rangeland and for nonirrigated crops. It is also used for hay and pasture, woodland, and wildlife habitat.

This unit has potential for providing habitat for mule deer, white-tailed deer, sharp-tailed grouse, gray partridge, and ring-necked pheasant.

The main limitations of this unit for homesite development are moderately steep and steep slopes, restricted permeability, moderate depth to shale and sandstone, shrink-swell potential, and low soil strength.

14. Doney-Winifred-Cabba

Shallow and moderately deep, well drained, gently sloping to very steep soils; on uplands

This map unit is in the northwestern part of the county. Slope is 2 to 60 percent. Elevation is 2,700 to 4,700 feet. The average annual precipitation is about 15 to 19 inches, the average annual air temperature is 40 to 45 degrees F, and the average frost-free season is 105 to 130 days.

This unit makes up about 5 percent of the survey area. It is about 30 percent Doney soils, 30 percent Winifred soils, and 10 percent Cabba soils. The remaining 30 percent is components of minor extent.

Doney soils are moderately deep and well drained. They formed in residuum derived dominantly from weakly consolidated sandy and silty sedimentary beds. They are loam throughout the profile. Sedimentary beds are at a depth of about 25 inches.

Winifred soils are moderately deep and well drained. They formed in local alluvium and residuum derived dominantly from semiconsolidated shale. They have a clay loam surface layer. The subsoil is mainly silty clay and clay. Shale is at a depth of about 32 inches.

Cabba soils are shallow and well drained. They formed in residuum derived dominantly from weakly consolidated sandy and silty sedimentary beds. They have a loam surface layer and channery loam underlying material. Sedimentary beds are at a depth of about 15 inches.

Of minor extent in this unit are Amor, Shambo, Linwell, Farnuf, Savage, Regent, Wayden, Reeder, and Floweree soils. The moderately deep Reeder, Regent, and Amor soils are on uplands. The deep Farnuf, Floweree, Linwell, Savage, and Shambo soils are on fans, terraces, and foot slopes. The shallow Wayden soils are on uplands and are underlain by shale.

This unit is used mainly for nonirrigated crops and as rangeland. It is also used for hay and pasture, woodland, and wildlife habitat.

This unit has potential for providing habitat for mule deer, white-tailed deer, pronghorn antelope, sharp-tailed grouse, gray partridge, and ring-necked pheasant.

The main limitations of this unit for homesite development are moderately steep to very steep slopes, shallow and moderate depth to sedimentary beds, potential frost action, and low soil strength. The slow permeability and shrink-swell potential of the Winifred soils are also limitations.

15. Delpoint-Yamac-Marmarth

Moderately deep and deep, well drained, nearly level to steep soils; on uplands, terraces, fans, and foot slopes

This map unit is mainly in the north-central part of the county. Slope is 0 to 45 percent. Elevation is 2,300 to 3,800 feet. The average annual precipitation is 10 to 14 inches, the average annual air temperature is 42 to 45 degrees F, and the average frost-free season is 115 to 135 days.

This unit makes up about 3 percent of the survey area. It is about 25 percent Delpoint soils, 20 percent Yamac soils, and 10 percent Marmarth soils. The remaining 45 percent is components of minor extent.

Delpoint soils are on uplands. These soils are moderately deep and well drained. They formed in residuum derived dominantly from weakly consolidated sandy and silty sedimentary beds. They are loam throughout the profile. Sedimentary beds are at a depth of about 25 inches.

Yamac soils are on terraces, fans, and foot slopes. These soils are deep and well drained. They formed in alluvium derived from mixed rock sources. They have a loam surface layer, a mainly silt loam and silty clay loam subsoil, and a loam and silty clay loam substratum.

Marmarth soils are on uplands. These soils are moderately deep and well drained. They formed in residuum derived dominantly from weakly consolidated sandy and silty sedimentary beds. They have a loam surface layer, a silty clay loam and silt loam subsoil, and a silt loam substratum. Sedimentary beds are at a depth of about 34 inches.

Of minor extent in this unit are Cabbart, Rentsac, Tanna, Evanston, Yawdim, Abor, Kobar, Gerdrum, Ethridge, Absher, and Nobe soils and Rock outcrop. The shallow Cabbart, Rentsac, and Yawdim soils are on uplands. The moderately deep Abor and Tanna soils are on uplands and are underlain by shale. The deep Absher, Ethridge, Gerdrum, Kobar, and Nobe soils are on fans and terraces. The Absher, Gerdrum, and Nobe soils are affected by salt and alkali. The deep Evanston soils are on fans, foot slopes, and terraces. Rock outcrop is on steep and very steep hillsides and on ridges.

This unit is used mainly for nonirrigated crops and as rangeland. It is also used for hay and pasture, woodland, and wildlife habitat.

This unit has potential for providing habitat for mule deer, white-tailed deer, pronghorn antelope, sharp-tailed grouse, gray partridge, and ring-necked pheasant.

The main limitations of this unit for homesite development are moderately steep and steep slopes, potential frost action, and low soil strength. Moderate depth to sedimentary beds is also a limitation for the Delpoint and Marmarth soils.

16. Tally-Flasher-Chinook

Shallow and deep, well drained and somewhat excessively drained, gently sloping to steep soils; on fans, terraces, foot slopes, and uplands

This map unit is mainly in the northeastern part of the county (fig. 3). Slope is 2 to 45 percent. Elevation is 2,400 to 4,500 feet. The average annual precipitation is about 10 to 19 inches, the average annual air temperature is 40 to 45 degrees F, and the average frost-free season is 110 to 135 days.

This unit makes up about 1 percent of the survey area. It is about 40 percent Tally soils, 30 percent Flasher soils, and 10 percent Chinook soils. The remaining 20 percent is components of minor extent.

Tally soils are on fans, terraces, and foot slopes. These soils are deep and well drained. They formed in alluvial and eolian material derived dominantly from sandstone. They have a fine sandy loam surface layer and subsoil and a loamy fine sand substratum.

Flasher soils are on uplands. These soils are shallow and somewhat excessively drained. They formed in residuum derived dominantly from weakly consolidated sandy sedimentary beds. They have a loamy fine sand surface layer and underlying material. Sedimentary beds are at a depth of about 16 inches.

Chinook soils are on fans, foot slopes, and uplands. These soils are deep and well drained. They formed in alluvial and eolian material derived dominantly from sandstone. They are fine sandy loam throughout the profile.

Figure 3.—Typical area of general soil map unit 16 along the Judith River Breaks.

Of minor extent in this unit are Rock outcrop and Vebar, Doney, Delpoint, Cabba, Cabbart, Gerdrum, and Weingart soils. Rock outcrop is on ledges and very steep side slopes of drainageways. The Delpoint, Doney, Vebar, and Weingart soils are moderately deep to bedrock. The moderately deep Weingart soils and the deep Gerdrum soils are affected by salt and alkali. The shallow Cabba and Cabbart soils are on uplands.

This unit is used mainly as rangeland. It is also used for hay and pasture, nonirrigated crops, woodland, and wildlife habitat.

This unit has potential for providing habitat for mule deer, pronghorn antelope, sharp-tailed grouse, gray partridge, and ring-necked pheasant.

The main limitations of this unit for homesite development are moderately steep and steep slopes and the shallow depth to sedimentary beds in the Flasher soils.

soils of the mountain foothills

This group consists of three map units. It makes up about 10 percent of the county. The soils in this group are gently sloping to very steep. Elevation is 3,000 to 8,000 feet. The average annual precipitation is 15 to 30 inches, the average annual air temperature is 38 to 45 degrees F, and the average frost-free season is 50 to 125 days.

The soils in this group are shallow to deep and are poorly drained and well drained. They formed in residuum, alluvium, and colluvium derived dominantly from sandstone, limestone, and shale.

This group is used mainly as rangeland and for nonirrigated hay and pasture. It is also used as woodland, for nonirrigated crops, and for wildlife habitat.

17. Castner-Timberg-Bitton

Shallow to deep, well drained, nearly level to very steep soils; mainly on uplands, foot slopes, fans, and edges of terraces

This map unit is in the south-central part of the county. Slope is 2 to 60 percent. Elevation is 3,000 to 4,800 feet. The average annual precipitation is 15 to 19 inches, the average annual air temperature is 40 to 45 degrees F, and the average frost-free season is 90 to 125 days.

This unit makes up about 4 percent of the survey area. It is about 30 percent Castner soils, 15 percent Timberg soils, and 10 percent Bitton soils. The remaining 45 percent is components of minor extent.

Castner soils are on uplands. These soils are shallow and well drained. They formed in residuum derived dominantly from fractured hard sandstone. They have a channery loam surface layer and very channery loam underlying material. Sandstone is at a depth of about 14 inches.

Timberg soils are on uplands. These soils are moderately deep and well drained. They formed in residuum derived dominantly from semiconsolidated shale interbedded with sandstone. They have a clay loam surface layer and a silty clay subsoil and substratum. Semiconsolidated shale is at a depth of about 37 inches.

Bitton soils are on fans, foot slopes, and edge of terraces. These soils are deep and well drained. They formed in alluvium and colluvium derived dominantly from sandstone. They have a channery loam surface layer. The underlying material is mainly extremely channery loam.

Of minor extent in this unit are Hibar, Darret, Terrad, Absarokee, Alder, Sinnigam, Straw, Fergus, and Pekay soils and Rock outcrop. The deep, well drained Fergus, Pekay, and Terrad soils are on terraces, fans, and uplands. The deep, well drained Straw soils are mainly on flood plains. The shallow, well drained Sinnigam soils and the moderately deep, well drained Absarokee, Alder, Darret, and Hibar soils are on uplands. Rock outcrop is on steep and very steep side slopes and on ridges.

This unit is used mainly as rangeland. It is also used for hay and pasture, nonirrigated crops, woodland, and wildlife habitat.

This unit has potential for providing habitat for mule deer, white-tailed deer, ring-necked pheasant, gray partridge, and sharp-tailed grouse.

The main limitations of this unit for homesite development are moderately steep to very steep slopes, shallow and moderate depths to sandstone and shale, and shrink-swell potential.

18. Hughesville-Castle-Tomty

Moderately deep and deep, poorly drained and well drained, undulating to very steep soils; on mountainsides, uplands, and foot slopes

This map unit is in the south-central part of the county. Slope is 2 to 60 percent. Elevation is 4,000 to 6,000 feet. The average annual precipitation is 19 to 30 inches, the average annual air temperature is 38 to 43 degrees F, and the average frost-free season is 60 to 110 days.

This unit makes up about 3 percent of the survey area. It is about 30 percent Hughesville soils, 15 percent Castle soils, and 15 percent Tomty soils. The remaining 40 percent is components of minor extent.

Hughesville soils are on mountainsides. These soils are moderately deep and well drained. They formed in residuum and colluvium derived dominantly from fractured hard limestone. The surface is covered with a mat of forest litter of needles, twigs, and cones. The surface layer is mainly flaggy loam, the subsoil is mainly very flaggy loam, and the substratum is extremely flaggy loam. Limestone is at a depth of about 38 inches.

Castle soils are on uplands. These soils are moderately deep and well drained. They formed in residuum derived dominantly from semiconsolidated

shale. They are clay throughout the profile. Semiconsolidated shale is at a depth of about 32 inches.

Tomty soils are on foot slopes. These soils are deep and poorly drained. They formed in alluvium and colluvium derived dominantly from shale. They have a silty clay surface layer and a silty clay and clay subsoil and substratum.

Of minor extent in this unit are Whitecow, Hanson, Skaggs, Sheege, Kildor, Hoosan, Delette, Burnel, and Burnette soils. The deep, well drained, forested Whitecow soils are on mountainsides and uplands. The shallow, well drained Sheege soils and the moderately deep, well drained Kildor and Skaggs soils are on uplands. The deep, well drained Hanson, Hoosan, Burnel, and Burnette soils are on terraces, fans, and foot slopes. The deep, moderately well drained Delette soils are on fans and foot slopes and are forested with quaking aspen.

This unit is used mainly as rangeland and for hay and pasture. It is also used for nonirrigated crops, woodland, and wildlife habitat.

This unit has potential for providing habitat for mule deer, white-tailed deer, black bear, ruffed grouse, and blue grouse.

The main limitations of this unit for homesite development are moderately steep to very steep slopes, moderate depth to limestone and shale, shrink-swell potential, and wetness.

19. Skaggs-Teton-Cheadle

Shallow and moderately deep, well drained, gently sloping to very steep soils; on uplands

This map unit is in the southern part of the county. Slope is 2 to 70 percent. Elevation is 4,700 to 8,000 feet. The average annual precipitation is 18 to 30 inches, the average annual air temperature is 38 to 42 degrees F, and the average frost-free season is 50 to 90 days.

This unit makes up about 3 percent of the survey area. It is about 30 percent Skaggs soils, 10 percent Teton soils, and 10 percent Cheadle soils. The remaining 50 percent is components of minor extent.

Skaggs soils are moderately deep and well drained. They formed in residuum derived dominantly from fractured hard limestone. The surface layer is mainly very stony loam, and the underlying material is very gravelly loam and very gravelly clay loam. Limestone is at a depth of about 32 inches.

Teton soils are moderately deep and well drained. They formed in residuum derived dominantly from fractured hard sandstone. They have a loam surface layer and subsoil. Sandstone is at a depth of about 32 inches.

Cheadle soils are shallow and well drained. They formed in residuum derived dominantly from fractured hard sandstone. The surface layer is mainly channery loam, and the underlying material is extremely channery and extremely flaggy loam. Sandstone is at a depth of about 19 inches.

Of minor extent in this unit are Whitecow, Hughesville, Tibs, Whitore, Sheege, Adel, Hanson, Raynesford, and Bridger soils and Rock outcrop. The well drained, forested Whitecow, Hughesville, Tibs, and Whitore soils are on mountainsides and uplands. The Hughesville soils are moderately deep over limestone. The deep Whitecow, Tibs, and Whitore soils formed in alluvium and colluvium derived dominantly from limestone and shale. The deep, well drained Adel, Bridger, Hanson, and Raynesford soils are on terraces, fans, and foot slopes. Rock outcrop is mainly outcroppings of limestone and sandstone along deeply dissected drainageways, on ridge crests, and on very steep mountainsides.

This unit is used mainly as rangeland. It is also used for hay and pasture, nonirrigated crops, woodland, and wildlife habitat.

This unit has potential for providing habitat for mule deer, white-tailed deer, black bear, ruffed grouse, and blue grouse.

The main limitations of this unit for homesite development are moderately steep to very steep slopes and the moderate and shallow depth to hard bedrock.

soils on mountainsides and uplands

This group consists of one map unit. It makes up about 10 percent of the county. The soils in this group are gently sloping to very steep. Elevation is 4,000 to 8,500 feet. The average annual precipitation is 19 to 30 inches, the average annual air temperature is 36 to 43 degrees F, and the average frost-free season is 50 to 110 days.

The soils in this group are deep and well drained. They formed mainly in alluvium and colluvium derived dominantly from limestone and sandstone.

Most areas of this group are used as woodland and rangeland. A few areas are used for hay and pasture, nonirrigated crops, and wildlife habitat.

20. Whitecow-Mocmont-Whitore

Deep, well drained, gently sloping to very steep soils; on mountainsides and uplands

This map unit is in the southern and central parts of the county (fig. 4). Slope is 2 to 60 percent. Elevation is 4,000 to 8,500 feet. The average annual precipitation is about 19 to 30 inches, the average annual air temperature is 36 to 43 degrees F, and the average frost-free season is 50 to 110 days.

This unit makes up about 10 percent of the survey area. It is about 30 percent Whitecow soils and similar soils, 30 percent Mocmont soils and similar soils, and 15 percent Whitore soils and similar soils. The remaining 25 percent is components of minor extent.

Whitecow soils are on mountainsides and uplands. These soils formed in alluvium and colluvium derived dominantly from limestone. The surface is covered with a

mat of needles, twigs, and cones. The surface layer is cobbly silty clay loam, the subsoil is cobbly silty clay loam and very cobbly clay loam, and the substratum is mainly extremely cobbly clay loam or extremely cobbly loam.

Figure 4.—Typical area of general soil map unit 20 in the southern part of the county.

Mocmont soils are on mountainsides and uplands. These soils formed in alluvium, colluvium, and residuum derived dominantly from sandstone. The surface is covered with a mat of needles, twigs, and cones. The surface layer is very gravelly loam, and the subsoil is extremely gravelly clay loam and extremely cobbly loam.

Whitore soils are on mountainsides. These soils formed in alluvium and colluvium derived dominantly from limestone. The surface is covered with a mat of needles, twigs, and cones. The surface layer is cobbly clay loam, and the subsoil is mainly very cobbly clay loam.

Of minor extent in this unit are Tomty, Delette, Hanson, Adel, Raynesford, Libeg, Loken, Brazon, Teton, Skaggs, Sheege, and Cheadle soils and Rock outcrop. The Rock outcrop is mainly outcroppings of limestone, sandstone, and igneous rock along deeply dissected drainageways, on ridge crests, and on very steep mountainsides. The poorly drained Tomty soils and the moderately well drained Delette soils are forested with quaking aspen and are on foot slopes. The deep, well drained Hanson, Adel, Raynesford, Loken, and Brazon soils are on fans, foot slopes, and terraces. The deep, well drained Libeg soils are on mountainsides. The shallow, well drained Sheege and Cheadle soils and the moderately deep, well drained Skaggs and Teton soils are on uplands.

This unit is used mainly as woodland and rangeland. It is also used for hay and pasture, nonirrigated crops, and wildlife habitat.

This unit has potential for providing habitat for mule deer, white-tailed deer, Rocky Mountain elk, black bear, Merriam's turkey, sharp-tailed grouse, ruffed grouse, and blue grouse.

The main limitations of this unit for homesite development are moderately steep to very steep slopes, content of rock fragments, and the short frost-free season.

detailed soil map units

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

Each map unit on the detailed soil maps represents an area on the landscape and consists of one or more soils for which the unit is named.

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

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

Soils of one series can differ in texture of the surface layer or of the underlying material. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Judith loam, 0 to 2 percent slopes, is one of several phases in the Judith series.

Some map units are made up of two or more major soils. These map units are called soil complexes, soil associations, or undifferentiated groups.

A *soil complex* consists of two or more soils in such an intricate pattern or in such small areas that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas. Gerdrum-Absher complex, 2 to 8 percent slopes, is an example.

A *soil association* is made up of two or more geographically associated soils that are shown as one unit on the maps. Because of present or anticipated soil uses in the survey area, it was not considered practical or necessary to map the soils separately. The pattern and relative proportion of the soils are somewhat similar. Mocmont-Lipke association, steep, is an example.

An *undifferentiated group* is made up of two or more soils that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils in a mapped area are not uniform. An area can be made up of only one of the major soils, or it can be made up of all of them. Havre and Harlem soils, occasionally flooded, is an undifferentiated group in this survey area.

Most map units include small scattered areas of soils other than those for which the map unit is named. Some of these included soils have properties that differ substantially from those of the major soil or soils. Such differences could significantly affect use and management of the soils in the map unit. The included soils are identified in each map unit description. Some small areas of strongly contrasting soils are identified by a special symbol on the soil maps.

This survey includes *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example. Miscellaneous areas are shown on the soil maps. Some that are too small to be shown are identified by a special symbol on the soil maps.

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

map unit descriptions

1—Abor-Crago complex, 4 to 8 percent slopes. This map unit is on uplands in the southeastern part of the county. Slopes commonly are 250 to 1,000 feet long. Elevation is 2,400 to 4,500 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 44 degrees F, and the average frost-free period is about 130 days.

This unit is about 45 percent Abor clay loam and 40 percent Crago gravelly clay loam. The Abor soil is on plane and convex side slopes of uplands, and the Crago soil is on terraces.

Included in this unit are small areas of deep Sanje soils that have slopes of 0 to 4 percent and are in concave areas and Crago very gravelly loam in convex

areas on ridges and knolls. Included areas make up about 15 percent of the total acreage.

The Abor soil is moderately deep and well drained. It formed in residuum and alluvium derived dominantly from semiconsolidated shale. Typically, the surface layer is grayish brown clay loam about 6 inches thick. The subsoil is light brownish gray and olive silty clay about 24 inches thick. Pale yellow semiconsolidated shale is at a depth of 30 inches. Depth to shale ranges from 20 to 40 inches.

Permeability of the Abor soil is slow. Available water capacity is low. Effective rooting depth is 20 to 40 inches. The average annual wetting depth where this soil is under native vegetation is 20 to 22 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high.

The Crago soil is deep and well drained. It formed in alluvium derived dominantly from limestone. Typically, the surface layer is grayish brown gravelly clay loam about 3 inches thick. The subsurface layer is pale brown gravelly clay loam about 4 inches thick. The upper 11 inches of the underlying material is very pale brown extremely gravelly loam, and the lower part to a depth of 60 inches or more is pale brown extremely gravelly sandy loam.

Permeability of the Crago soil is moderate to a depth of 18 inches and moderately rapid below this depth. Available water capacity is moderate to low. Effective rooting depth is 60 inches. The average annual wetting depth where this soil is under native vegetation is about 24 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high.

The soils in this unit are used mainly as rangeland. They are also used for nonirrigated crops, mainly wheat, barley, alfalfa, and grass for hay and pasture.

These soils are suited to nonirrigated crops. They are limited mainly by low to moderate available water capacity and the hazards of water erosion and soil blowing. Minimum tillage, contour cultivation, grassed waterways, stripcropping, and growing sod crops help to control soil blowing and water erosion. Tall grass barriers trap snow, which increases the amount of moisture in the soil.

The potential plant community on the Abor soil is mainly bluebunch wheatgrass, green needlegrass, western wheatgrass, and thickspike wheatgrass. If the range is excessively grazed, the proportion of these plants decreases and the proportion of plains reedgrass, Sandberg bluegrass, prairie junegrass, and big sagebrush increases. If excessive grazing continues, plants such as perennial weeds, broom snakeweed, curlycup gumweed, and annual bromes may invade. The potential plant community produces about 1,400 pounds of air-dry vegetation in years of above-normal precipitation and 800 pounds in years of below-normal precipitation.

The potential plant community on the Crago soil is mainly bluebunch wheatgrass, western wheatgrass, green needlegrass, needleandthread, and plains muhly. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of needleandthread, blue grama, prairie junegrass, and fringed sagewort increases. If excessive grazing continues, plants such as perennial weeds, broom snakeweed, clubmoss, and annuals may invade. The potential plant community produces about 800 pounds of air-dry vegetation in years of above-normal precipitation and 400 pounds in years of below-normal precipitation.

Range seeding to adapted grasses and forbs is suitable on these soils if the range is in poor condition. Seedbed preparation and planting on the contour or across the slope, where practical, help to control water erosion.

The Abor soil is suited to windbreaks, but the low available water capacity of the soil limits the growth of both trees and shrubs. Suitable trees for planting are Russian-olive, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, western sandcherry, and skunkbush sumac.

The Crago soil is suited to windbreaks, but the high concentration of lime at a depth of less than 15 inches and the limited moisture supply restrict the choice of trees and shrubs. Suitable trees for planting are Russian-olive, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, and skunkbush sumac. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings.

The main limitations for homesite development on the Abor soil are slow permeability, depth to shale, shrink-swell potential, and low soil strength. This soil is severely limited for septic tank absorption fields because of the slow permeability and moderate depth to shale. Cuts to level building sites can expose shale. Shrinking and swelling and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential.

The main limitations for homesite development on the Crago soil are potential frost action and the content of rock fragments. Frost action can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome this limitation. The very gravelly or extremely gravelly material of the Crago soil below a depth of 7 inches is good roadfill. Removal of pebbles and cobbles in disturbed areas is needed for best results when landscaping, particularly in areas used for lawns.

This map unit is in capability subclass IVe, nonirrigated. The Abor soil is in Clayey range site, 10- to 14-inch precipitation zone, and the Crago soil is in Limy range site, 10- to 14-inch precipitation zone.

2—Abor-Crago complex, 8 to 25 percent slopes. This map unit is on uplands in the east-central and southeastern parts of the county. Slopes commonly are 250 to 1,000 feet long. Elevation is 2,400 to 4,500 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 44 degrees F, and the average frost-free period is about 130 days.

This unit is about 45 percent Abor silty clay and 35 percent Crago gravelly loam. The Abor soil is on convex and smooth slopes of uplands, and the Crago soil is on terrace edges.

Included in this unit are small areas of deep Sanje soils that have slopes of 0 to 4 percent and are in concave areas and Crago very gravelly loam in convex areas on ridges and knolls. Included areas make up about 20 percent of the total acreage.

The Abor soil is moderately deep and well drained. It formed in residuum and alluvium derived dominantly from semiconsolidated shale. Typically, the surface layer is grayish brown silty clay about 6 inches thick. The subsoil is light brownish gray and olive silty clay about 24 inches thick. Pale yellow semiconsolidated shale is at a depth of 30 inches. Depth to shale ranges from 20 to 40 inches.

Permeability of the Abor soil is slow. Available water capacity is low. Effective rooting depth is 20 to 40 inches. The average annual wetting depth where this soil is under native vegetation is 20 to 22 inches. Runoff is medium to rapid, and the hazard of water erosion is high. The hazard of soil blowing is high.

The Crago soil is deep and well drained. It formed in alluvium derived dominantly from limestone. Typically, the surface layer is grayish brown gravelly loam 3 inches thick. The subsurface layer is pale brown gravelly loam 4 inches thick. The upper 11 inches of the underlying material is very pale brown extremely gravelly loam, and the lower part to a depth of 60 inches or more is pale brown extremely gravelly sandy loam.

Permeability of the Crago soil is moderate to a depth of 18 inches and moderately rapid below this depth. Available water capacity is moderate to low. Effective rooting depth is 60 inches. The average annual wetting depth where this soil is under native vegetation is about 24 inches. Runoff is medium to rapid, and the hazard of water erosion is high. The hazard of soil blowing is high.

The soils in this unit are used as rangeland.

These soils are poorly suited to cultivated crops and to hay and pasture because of steepness of slope and rough topography.

The potential plant community on the Abor soil is mainly bluebunch wheatgrass, green needlegrass, western wheatgrass, and thickspike wheatgrass. If the range is excessively grazed, the proportion of these plants decreases and the proportion of plains reedgrass, Sandberg bluegrass, prairie junegrass, and big sagebrush increases. If excessive grazing continues, plants such as perennial weeds, broom snakeweed, curlycup gumweed, and annual bromes may invade. The potential plant community produces about 1,400 pounds of air-dry vegetation in years of above-normal precipitation and 800 pounds in years of below-normal precipitation.

The potential plant community on the Crago soil is mainly bluebunch wheatgrass, western wheatgrass, needleandthread, and plains muhly. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of needleandthread, blue grama, prairie junegrass, and fringed sagewort increases. If excessive grazing continues, plants such as perennial weeds, broom snakeweed, clubmoss, and annuals may invade. The potential plant community produces about 800 pounds of air-dry vegetation in years of above-normal precipitation and 400 pounds in years of below-normal precipitation.

Brush management improves deteriorated areas of range that are producing more woody shrubs than were present in the potential plant community.

These soils are poorly suited to windbreaks. They are limited mainly by slope.

The main limitations for homesite development on the Abor soil are slow permeability, slope, depth to shale, shrink-swell potential, and low soil strength. This soil is severely limited for septic tank absorption fields because of the slow permeability, moderately steep slopes, and moderate depth to shale. Cuts to level building sites can expose shale. Shrinking and swelling and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential.

The main limitations for homesite development on the Crago soil are potential frost action and content of rock fragments. Slope is a concern in installing septic tank absorption fields. Absorption lines should be installed on the contour. Frost action can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome this limitation. The extremely gravelly material below a depth of 7 inches is good roadfill. Removal of pebbles and cobbles in disturbed areas is needed for best results when landscaping, particularly in areas used for lawns.

This map unit is in capability subclass VIe, nonirrigated. The Abor soil is in Clayey range site, 10- to 14-inch precipitation zone, and the Crago soil is in Limy range site, 10- to 14-inch precipitation zone.

3—Abor-Thebo-Crago complex, 15 to 45 percent slopes. This map unit is on uplands in the east-central and southeastern parts of the county. Slopes commonly are more than 1,000 feet long. Elevation is 2,400 to 4,500 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 44 degrees F, and the average frost-free period is about 130 days.

This unit is about 35 percent Abor silty clay, 30 percent Thebo clay, and 10 percent Crago very gravelly loam. The Abor and Thebo soils are on plane and convex side slopes of uplands, and the Crago soil is on terrace edges.

Included in this unit are small areas of deep Marias and Marvan soils on foot slopes, terraces, and fans. The Marias soils have slopes of 0 to 4 percent, and the salt- and alkali-affected Marvan soils have slopes of 0 to 8 percent. Also included are small areas of Crago extremely gravelly loam on terrace edges. Included areas make up about 25 percent of the total acreage.

The Abor soil is moderately deep and well drained. It formed in residuum or alluvium derived dominantly from semiconsolidated shale. Typically, the surface layer is grayish brown silty clay about 6 inches thick. The subsoil is light brownish gray and olive silty clay about 24 inches thick. Pale yellow semiconsolidated shale is at a depth of 30 inches. Depth to shale ranges from 20 to 40 inches.

Permeability of the Abor soil is slow. Available water capacity is low. Effective rooting depth is 20 to 40 inches. The average annual wetting depth where this soil is under native vegetation is 20 to 22 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is high.

The Thebo soil is moderately deep and well drained. It formed in residuum derived dominantly from semiconsolidated shale. Typically, the surface layer is grayish brown clay about 5 inches thick. The underlying material is grayish brown clay about 28 inches thick. Gray semiconsolidated shale is at a depth of 33 inches. Depth to shale ranges from 20 to 40 inches.

Permeability of the Thebo soil is very slow. Available water capacity is low. Effective rooting depth is 20 to 40 inches. The average annual wetting depth where this soil is under native vegetation is about 20 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is high.

The Crago soil is deep and well drained. It formed in alluvium derived dominantly from limestone. Typically, the surface layer is grayish brown very gravelly loam about 3 inches thick. The subsurface layer is pale brown extremely gravelly loam about 4 inches thick. The upper 11 inches of the underlying material is very pale brown extremely gravelly loam, and the lower part to a depth of 60 inches or more is pale brown extremely gravelly sandy loam.

Permeability of the Crago soil is moderate to a depth of 18 inches and moderately rapid below this depth. Available water capacity is moderate to low. Effective rooting depth is 60 inches. The average annual wetting depth where this soil is under native vegetation is about 24 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is high.

The soils in this unit are used as rangeland.

These soils are poorly suited to cultivated crops and to hay and pasture because of the steepness of slope and rough topography.

The potential plant community on the Abor and Thebo soils is mainly bluebunch wheatgrass, green needlegrass, western wheatgrass, and thickspike wheatgrass. If the range is excessively grazed, the proportion of these plants decreases and the proportion of plains reedgrass, Sandberg bluegrass, prairie junegrass, and big sagebrush increases. If excessive grazing continues, plants such as perennial weeds, broom snakeweed, curlycup gumweed, and annual bromes may invade. The potential plant community produces about 1,400 pounds of air-dry vegetation in years of above-normal precipitation and 800 pounds in years of below-normal precipitation.

The potential plant community on the Crago soil is mainly bluebunch wheatgrass, western wheatgrass, needleandthread, and plains muhly. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of needleandthread, blue grama, prairie junegrass, and fringed sagewort increases. If excessive grazing continues, plants such as perennial weeds, broom snakeweed, clubmoss, and annuals may invade. The potential plant community produces about 800 pounds of air-dry vegetation in years of above-normal precipitation and 400 pounds in years of below-normal precipitation.

The surface layer on these soils is susceptible to water erosion and soil blowing if it is disturbed or, if the range is overgrazed.

These soils are poorly suited to windbreaks. They are limited mainly by slope.

The soils in this unit are poorly suited to homesite development because of the steepness of slope and the moderate depth to shale in the Abor and Thebo soils. The very gravelly or extremely gravelly material in the Crago soil below a depth of 7 inches is good roadfill.

This map unit is in capability subclass VIIe, nonirrigated. The Abor and Thebo soils are in Clayey range site, 10- to 14-inch precipitation zone, and the Crago soil is in Limy range site, 10- to 14-inch precipitation zone.

4—Abor-Yawdim silty clay loams, 4 to 15 percent slopes. This map unit is on uplands in the northern and eastern parts of the county. Slopes commonly are 250 to 1,000 feet long. Elevation is 2,400 to 4,500 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 44 degrees F, and the average frost-free period is about 130 days.

This unit is about 50 percent Abor silty clay loam and 30 percent Yawdim silty clay loam. The Abor soil is on plane side slopes, and the Yawdim soil is on ridges and knolls.

Included in this unit are small areas of moderately deep Tanna soils on plane side slopes and deep Kobar soils on foot slopes. Also included are small areas of deep, salt- and alkali-affected Gerdrum soils on fans. Included areas make up about 20 percent of the total acreage.

The Abor soil is moderately deep and well drained. It formed in residuum derived dominantly from semiconsolidated shale. Typically, the surface layer is grayish brown silty clay loam about 6 inches thick. The subsoil is light brownish gray and olive silty clay about 24 inches thick. Pale yellow semiconsolidated shale is at a depth of 30 inches. Depth to shale ranges from 20 to 40 inches.

Permeability of the Abor soil is slow. Available water capacity is low. Effective rooting depth is 20 to 40 inches. The average annual wetting depth where this soil is under native vegetation is 20 to 22 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high.

The Yawdim soil is shallow and well drained. It formed in residuum derived dominantly from semiconsolidated shale. Typically, the surface layer is grayish brown silty clay loam about 3 inches thick. The underlying material is grayish brown silty clay loam about 9 inches thick. Grayish brown and light olive brown semiconsolidated shale is at a depth of 12 inches. Depth to shale ranges from 10 to 20 inches.

Permeability of the Yawdim soil is slow. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. The average annual wetting depth where this soil is under native vegetation is 10 to 20 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high.

The soils in this unit are used for nonirrigated crops, mainly wheat, barley, oats, alfalfa, and grass for hay and pasture. They are also used as rangeland.

These soils are suited to nonirrigated crops. They are limited mainly by low precipitation, the low and very low available water capacity, and the hazards of soil blowing and water erosion. Minimum tillage, contour cultivation, grassed waterways, stripcropping, and growing sod crops such as hay and pasture help to control soil blowing and water erosion.

The potential plant community on the Abor soil is mainly bluebunch wheatgrass, green needlegrass, western wheatgrass, and thickspike wheatgrass. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of plains reedgrass, Sandberg bluegrass, prairie junegrass, and big sagebrush increases. If excessive grazing continues, plants such as perennial weeds, broom snakeweed, curlycup gumweed, and annual bromes may invade. The potential plant community produces about 1,400 pounds of air-dry vegetation in years of above-normal precipitation and 800 pounds in years of below-normal precipitation.

The potential plant community on the Yawdim soil is mainly western wheatgrass, plains reedgrass, plains muhly, and green needlegrass. If the range is excessively grazed, the proportion of these plants decreases and the proportion of fringed sagebrush, plains reedgrass, blue grama, and wild rose increases. If excessive grazing continues, plants such as broom snakeweed, creeping juniper, perennial weeds, and annuals may invade. The potential plant community produces about 700 pounds of air-dry vegetation in years of above-normal precipitation and 300 pounds in years of below-normal precipitation.

These soils are suited to seeding of adapted grasses and forbs if the range is in poor condition. Seedbed preparation and planting on the contour or across the slope, where practical, help to control water erosion.

The Abor soil is suited to windbreaks, but the low available water capacity of the soil limits the growth of both trees and shrubs. Suitable trees for planting are Russian-olive, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, western sandcherry, and skunkbush sumac. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings. Planting on the contour helps to conserve moisture.

The Yawdim soil is poorly suited to windbreaks. It is limited mainly by the very low available water capacity.

The soils in this unit are poorly suited to homesite development. The main limitations of the Abor soil are slow permeability, moderate depth to shale, shrink-swell potential, and low soil strength. This soil is severely limited for septic tank absorption fields because of the slow permeability and the moderate depth to shale. Cuts to level building sites can expose shale. Shrinking and swelling and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential.

The main limitations for homesite development on the Yawdim soil are slow permeability, shallow depth to shale, shrink-swell potential, potential frost action, and low soil strength. This soil is severely limited for septic tank absorption fields because of the slow permeability and the shallow depth to shale. Shrinking and swelling, frost action, and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell

potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential.

This map unit is in capability subclass IVe, nonirrigated. The Abor soil is in Clayey range site, 10- to 14-inch precipitation zone, and the Yawdim soil is in Shallow range site, 10- to 14-inch precipitation zone.

5—Absarokee clay loam, 2 to 8 percent slopes. This moderately deep, well drained, undulating to gently rolling soil is on uplands in the central part of the county. It formed in residuum derived from consolidated shale interbedded with sandstone. Slopes commonly are 250 to 1,000 feet long. Elevation is 3,000 to 4,600 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 120 days.

Included in this unit are small areas of shallow Amherst and Castner soils on ridges and knolls.

Typically, the surface layer of this Absarokee soil is grayish brown clay loam about 7 inches thick. The upper 8 inches of the subsoil is brown silty clay, and the lower 3 inches is light brownish gray clay loam. The substratum is light gray clay loam about 8 inches thick. Light gray shale and sandstone are at a depth of about 26 inches. Depth to shale and sandstone ranges from 20 to 40 inches.

Permeability is moderately slow. Available water capacity is low. Effective rooting depth is about 20 to 40 inches. The average annual wetting depth where this soil is under native vegetation is 20 to 30 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

This soil is used for nonirrigated crops, mainly wheat, barley, oats, alfalfa, and grass for hay and pasture. It is also used as rangeland.

This soil is well suited to nonirrigated crops. It is limited mainly by limited precipitation and the hazards of water erosion and soil blowing. Minimum tillage, contour cultivation, grassed waterways, stripcropping, and growing sod crops such as hay and pasture help to control soil blowing and water erosion.

The potential plant community on this soil is mainly rough fescue, bluebunch wheatgrass, green needlegrass, and western wheatgrass. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of needleandthread, blue grama, Idaho fescue, and western wheatgrass increases. If excessive grazing continues, plants such as timothy, Kentucky bluegrass, clubmoss, and perennial weeds may invade. The potential plant community produces about 2,400 pounds of air-dry vegetation in years of above-normal precipitation and 1,900 pounds in years of below-normal precipitation.

This soil is suited to mechanical treatment that improves water infiltration and encourages the growth of desirable native plants. Mechanical treatment should be on the contour or across the slope where practical to control erosion and conserve moisture. If the range vegetation has seriously deteriorated, seeding is needed. Seedbed preparation and planting on the contour or across the slope, where practical, conserve moisture and help to control water erosion.

This soil is suited to windbreaks. The low available water capacity of the soil limits the growth of both trees and shrubs. Suitable trees for planting are Russian-olive, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, western sandcherry, and skunkbush sumac. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings.

The main limitations for homesite development on this soil are moderately slow permeability, moderate depth to shale and sandstone, shrink-swell potential, and low soil strength. This soil is severely limited for septic tank absorption fields because of the moderately slow permeability and moderate depth to shale and sandstone. Cuts to level building sites can expose shale and sandstone. Shrinking and swelling and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential.

This map unit is in capability subclass IIIe, nonirrigated, and in Silty range site, 15- to 19-inch precipitation zone.

6—Absarokee-Amherst clay loams, 8 to 15 percent slopes. This map unit is on strongly rolling uplands in the central part of the county. Slopes commonly are more than 1,000 feet long. Elevation is 3,000 to 4,600 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 120 days.

This unit is about 40 percent Absarokee clay loam and about 35 percent Amherst clay loam. The Absarokee soil is on plane side slopes, and the Amherst soil is on convex side slopes.

Included in this unit are small areas of shallow Castner and Sinnigam soils on ridgetops. Also included are small areas of moderately deep, stony Borky soils on plane slopes. Included areas make up about 25 percent of the total acreage.

The Absarokee soil is moderately deep and well drained. It formed in residuum derived dominantly from consolidated shale interbedded with sandstone. Typically, the surface layer is grayish brown clay loam about 7 inches thick. The upper 8 inches of the subsoil is brown silty clay, and the lower 3 inches is light brownish gray clay loam. The substratum is light gray clay loam about 8 inches thick. Light gray shale and

sandstone are at a depth of about 26 inches. Depth to bedrock ranges from 20 to 40 inches.

Permeability of the Absarokee soil is moderately slow. Available water capacity is low. Effective rooting depth is 20 to 40 inches. The average annual wetting depth where this soil is under native vegetation is 20 to 30 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

The Amherst soil is shallow and well drained. It formed in residuum derived dominantly from consolidated shale interbedded with sandstone. Typically, the surface layer is grayish brown clay loam about 2 inches thick. The upper 3 inches of the subsoil is grayish brown channery clay, and the lower 7 inches is brown channery clay. Light brownish gray shale and sandstone are at a depth of 12 inches. Depth to shale and sandstone ranges from 10 to 20 inches.

Permeability of the Amherst soil is moderately slow. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. The average annual wetting depth where this soil is under native vegetation is 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

The soils in this unit are used mainly as rangeland. They are also used for hay and pasture.

These soils are suited to hay and pasture. They are limited mainly by the hazards of water erosion and soil blowing and by the droughtiness of the Amherst soil. All adapted pasture plants can be grown, but bunch-type species planted alone generally are not suitable because of the hazard of erosion. Seedbed preparation and planting on the contour or across the slope, where practical, help to control water erosion.

The potential plant community on the Absarokee soil is mainly rough fescue, bluebunch wheatgrass, green needlegrass, and western wheatgrass. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of western wheatgrass, needleandthread, Idaho fescue, and blue grama increases. If excessive grazing continues, plants such as timothy, Kentucky bluegrass, clubmoss, and perennial weeds may invade. The potential plant community produces about 2,400 pounds of air-dry vegetation in years of above-normal precipitation and 1,900 pounds in years of below-normal precipitation.

The potential plant community on the Amherst soil is mainly rough fescue, green needlegrass, bluebunch wheatgrass, and plains muhly. If the range is excessively grazed, the proportion of these plants decreases and the proportion of Idaho fescue, blue grama, needleandthread, and prairie junegrass increases. If excessive grazing continues, plants such as clubmoss, Kentucky bluegrass, perennial weeds, and annuals may invade. The potential plant community produces about 1,500 pounds of air-dry vegetation in years of above-normal precipitation and 900 pounds in years of below-normal precipitation.

If the range vegetation is seriously deteriorated, seeding is needed. Seedbed preparation and planting on the contour or across the slope, where practical, conserve moisture and help to control water erosion.

The Absarokee soil is suited to windbreaks, but the low available water capacity of the soil limits the growth of both trees and shrubs. Suitable trees for planting are Russian-olive, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, western sandcherry, and skunkbush sumac. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings. Planting on the contour helps to conserve moisture.

The Amherst soil is poorly suited to windbreaks. It is limited mainly by the very low available water capacity.

The main limitations for homesite development are moderately slow permeability, slope, moderate and shallow depth to shale and sandstone, shrink-swell potential, and low soil strength. These soils are severely limited for septic tank absorption fields because of the moderately slow permeability and the moderate and shallow depth to shale and sandstone. Cuts to level building sites can expose shale and sandstone. Shrinking and swelling and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential.

This map unit is in capability subclass IVe, nonirrigated. The Absarokee soil is in Silty range site, 15- to 19-inch precipitation zone, and the Amherst soil is in Shallow range site, 15- to 19-inch precipitation zone.

7—Absarokee-Bitton-Maginnis complex, 15 to 60 percent slopes. This map unit is on uplands in the central part of the county. Slopes commonly are 250 to 1,000 feet long. Elevation is 3,000 to 4,600 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 120 days.

This unit is about 35 percent Absarokee clay loam, about 25 percent Bitton channery loam, and about 20 percent Maginnis channery clay loam. The Absarokee soil is on smooth, concave side slopes, the Bitton soil is on foot slopes below the Absarokee soil, and the Maginnis soil is on ridges. The Absarokee and Maginnis soils have slopes of 15 to 45 percent, and the Bitton soil has slopes of 15 to 60 percent.

Included in this unit are small areas of shallow Amherst and Castner soils on ridges and small areas of moderately deep Eltsac and Winifred soils on backslopes. Also included are small areas of Rock outcrop. Included areas make up about 20 percent of the total acreage.

The Absarokee soil is moderately deep and well drained. It formed in residuum derived dominantly from consolidated shale interbedded with sandstone. Typically, the surface layer is grayish brown clay loam about 7 inches thick. The upper 8 inches of the subsoil is brown silty clay loam, and the lower 3 inches is light brownish gray clay loam. The substratum is light gray clay loam about 8 inches thick. Light gray shale and sandstone are at a depth of about 26 inches. Depth to shale and sandstone ranges from 20 to 40 inches.

Permeability of the Absarokee soil is moderately slow. Available water capacity is low. Effective rooting depth is 20 to 40 inches. The average annual wetting depth where this soil is under native vegetation is 20 to 30 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

The Bitton soil is deep and well drained. It formed in alluvium and colluvium derived dominantly from sandstone. Typically, the surface layer is dark grayish brown channery loam about 7 inches thick. The next layer is brown channery loam about 4 inches thick. The upper part of the underlying material is pale brown extremely channery loam about 19 inches thick, and the lower part to a depth of 60 inches or more is pale brown very channery loam.

Permeability of the Bitton soil is moderate. Available water capacity is moderate to low. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is about 30 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

The Maginnis soil is shallow and well drained. It formed in residuum derived dominantly from hard shale interbedded with sandstone. Typically, the surface layer is grayish brown channery clay loam about 7 inches thick. The subsoil is grayish brown very channery and extremely channery clay loam about 10 inches thick. Light brownish gray hard shale and sandstone are at a depth of 17 inches. Depth to shale and sandstone ranges from 10 to 20 inches.

Permeability of the Maginnis soil is moderately slow. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. The average annual wetting depth where this soil is under native vegetation is 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

The soils in this unit are used as rangeland.

These soils are poorly suited to cultivated crops and to hay and pasture because of steepness of slope and rough topography.

The potential plant community on the Absarokee and Bitton soils is mainly rough fescue, bluebunch wheatgrass, green needlegrass, and western wheatgrass. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of western wheatgrass, needleandthread, Idaho fescue, and blue grama increases. If excessive grazing continues, plants such as Kentucky bluegrass, clubmoss, timothy, and perennial weeds may invade. The potential plant community produces about 2,300 pounds of air-dry vegetation in years of above-normal precipitation and 1,600 pounds in years of below-normal precipitation.

The potential plant community on the Maginnis soil is mainly bluebunch wheatgrass, rough fescue, plains muhly, and green needlegrass. If the range is excessively grazed, the proportion of these plants decreases and the proportion of Idaho fescue, blue grama, prairie junegrass, and needleandthread increases. If excessive grazing continues, plants such as annuals, clubmoss, Kentucky bluegrass, and perennial weeds may invade. The potential plant community produces about 1,500 pounds of air-dry vegetation in years of above-normal precipitation and 900 pounds in years of below-normal precipitation.

Steepness of slope limits access of livestock and promotes overgrazing of the less sloping areas. The surface layer is susceptible to water erosion if it is disturbed or if the range is overgrazed.

These soils are poorly suited to windbreaks. They are limited mainly by slope.

The soils in this unit are poorly suited to homesite development because of the steepness of slope, the moderate depth to shale and sandstone in the Absarokee soil, and the shallow depth to hard shale and sandstone in the Maginnis soil.

This map unit is in capability subclass VIIe, nonirrigated. The Absarokee and Bitton soils are in Silty range site, 15- to 19-inch precipitation zone, and the Maginnis soil is in Shallow range site, 15- to 19-inch precipitation zone.

8—Absher clay loam, 0 to 4 percent slopes. This deep, moderately well drained soil is on terraces and fans in the eastern part of the county. It formed in alluvium derived from mixed rock sources. Slopes commonly are 250 to 1,000 feet long. Elevation is 2,200 to 3,800 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 44 degrees F, and the average frost-free period is about 130 days.

Included in this unit are small areas of deep, salt- and alkali-affected Marvan and Nobe soils. The Nobe soils are in small depressions and are nearly barren of vegetation.

Typically, the surface layer of this Absher soil is light brownish gray clay loam about 1 1/2 inches thick. The subsoil is grayish brown clay about 17 1/2 inches thick. The upper 7 inches of the substratum is grayish brown clay, and the lower part to a depth of 60 inches or more is light brownish gray clay and silty clay.

Permeability is very slow. Available water capacity is moderate. This soil is salt- and alkali-affected in the subsoil and substratum. Effective rooting depth is 60

inches or more. The average annual wetting depth where this soil is under native vegetation is about 22 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

This soil is used as rangeland.

This soil is poorly suited to cultivated crops and to hay and pasture because of the high content of salt and alkali in the subsoil and substratum.

The potential plant community on this soil is mainly western wheatgrass, alkali sacaton, green needlegrass, and thickspike wheatgrass. If the range is excessively grazed, the proportion of these plants decreases and the proportion of inland saltgrass, blue grama, sand dropseed, and big sagebrush increases. If excessive grazing continues, plants such as annuals, knotweed, pricklypear, and tumblegrass may invade. The potential plant community produces about 900 pounds of air-dry vegetation in years of above-normal precipitation and 400 pounds in years of below-normal precipitation.

This soil is suited to mechanical treatment practices that improve infiltration and restore the desirable native plants.

This soil is poorly suited to windbreaks. It is strongly saline, which limits the choice of trees and shrubs to Russian-olive and silver buffaloberry. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings.

The main limitations for homesite development on this soil are very slow permeability, salinity, shrink-swell potential, corrosivity to concrete, and low soil strength. If this soil is used for septic tank absorption fields, the very slow permeability can be overcome by increasing the size of the absorption field or by excavating the trench to a suitable depth. The field or trench should be backfilled with gravel. Shrinking and swelling and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential. Use of salt-resistant concrete helps to overcome the corrosivity.

This map unit is in capability subclass VIs, nonirrigated, and in Dense Clay range site, 10- to 14-inch precipitation zone.

9—Absher-Nobe complex, 0 to 4 percent slopes. This map unit is on terraces and fans in the eastern part of the county. Elevation is 2,200 to 3,800 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 44 degrees F, and the average frost-free period is about 130 days.

This unit is about 45 percent Absher clay loam and 35 percent Nobe clay.

Included in this unit are small areas of deep, salt- and alkali-affected Marvan and Vanda soils. The Vanda soil has a crusty clay surface layer. Included areas make up about 20 percent of the total acreage.

The Absher soil is deep and moderately well drained. It formed in alluvium derived from mixed rock sources. Typically, the surface layer is light brownish gray clay loam about 1 1/2 inches thick. The subsoil is grayish brown clay about 17 1/2 inches thick. The upper 7 inches of the substratum is grayish brown clay, and the lower part to a depth of 60 inches or more is light brownish gray clay and silty clay.

Permeability of the Absher soil is very slow. Available water capacity is moderate. This soil is salt- and alkali-affected in the subsoil and substratum. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is about 22 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

The Nobe soil is deep and moderately well drained. It formed in alluvium derived from mixed rock sources. Typically, the surface layer is light gray fine sandy loam about 1 inch thick. The subsoil is grayish brown clay about 7 inches thick. The upper 16 inches of the substratum is light olive gray clay, and the lower part to a depth of 60 inches or more is olive gray clay.

Permeability of the Nobe soil is very slow. Available water capacity is low. This soil is salt- and alkali-affected in the subsoil and substratum. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is about 22 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high.

The soils in this unit are used as rangeland.

These soils are poorly suited to cultivated crops and to hay and pasture because of the high content of salt and alkali in the subsoil and substratum.

The potential plant community on the Absher soil is mainly western wheatgrass, alkali sacaton, thickspike wheatgrass, and green needlegrass. If the range is excessively grazed, the proportion of these plants decreases and the proportion of inland saltgrass, blue grama, sand dropseed, and big sagebrush increases. If excessive grazing continues, plants such as annuals, knotweed, pricklypear, and tumblegrass may invade. The potential plant community produces about 900 pounds of air-dry vegetation in years of above-normal precipitation and 400 pounds in years of below-normal precipitation.

The potential plant community on the Nobe soil is mainly western wheatgrass, bottlebrush squirreltail, alkaligrass, and Nuttall saltbush. If the range is excessively grazed, the proportion of these plants decreases and the proportion of Sandberg bluegrass, inland saltgrass, black greasewood, and big sagebrush increases. If excessive grazing continues, plants such as foxtail barley, glasswort, seepweed, and annuals may invade. The potential plant community produces about

200 pounds of air-dry vegetation in years of above-normal precipitation and 75 pounds in years of below-normal precipitation.

These soils are suited to mechanical treatment.

The Absher soil is poorly suited to windbreaks. It is strongly saline, which limits the choice of trees and shrubs to Russian-olive and silver buffaloberry. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings.

The Nobe soil is very poorly suited to windbreaks. It is limited mainly by the high content of salt and alkali.

The main limitations for homesite development on these soils are very slow permeability, salinity, shrink-swell potential, corrosivity to concrete, and low soil strength. If these soils are used for septic tank absorption fields, the very slow permeability can be overcome by increasing the size of the absorption field or by excavating the trench to a suitable depth. The field or trench should be backfilled with gravel. Shrinking and swelling and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential. Use of a salt-resistant concrete helps to overcome the corrosivity.

This map unit is in capability subclass VIs, nonirrigated. The Absher soil is in Dense Clay range site, 10- to 14-inch precipitation zone, and the Nobe soil is in Saline Uplands range site, 10- to 14-inch precipitation zone.

10—Adel loam, 2 to 15 percent slopes. This deep, well drained soil is on fans and foot slopes in the south-central part of the county. It formed in alluvium and colluvium derived dominantly from sandstone. Slopes commonly are 250 to 1,000 feet long. Elevation is 4,700 to 6,500 feet. The average annual precipitation is about 22 inches, the average annual air temperature is about 42 degrees F, and the average frost-free period is about 70 days.

Included in this unit are small areas of moderately deep Teton soils on upland toe slopes.

Typically, the surface layer of this Adel soil is dark gray loam about 13 inches thick. The next layer is dark grayish brown and grayish brown loam about 25 inches thick. The subsoil to a depth of 60 inches or more is brown channery loam.

Permeability is moderate. Available water capacity is high. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

This soil is used for nonirrigated crops, mainly wheat, barley, oats, alfalfa, and grass for hay and pasture. It is also used as rangeland.

This soil is suited to nonirrigated crops. It is limited mainly by the short growing season and the hazards of water erosion and soil blowing. Timeliness is of prime importance in all seeding, tillage, and harvesting operations. Minimum tillage, contour cultivation, grassed waterways, stubble mulch tillage, and growing sod crops such as hay and pasture help to control soil blowing and water erosion.

The potential plant community on this soil is mainly rough fescue, mountain brome, bluebunch wheatgrass, and Columbia needlegrass. If the range is excessively grazed, the proportion of these plants decreases and the proportion of Idaho fescue, western wheatgrass, Letterman needlegrass, and spikeoat increases. If excessive grazing continues, plants such as Kentucky bluegrass, timothy, onespike danthonia, and forbs may invade. The potential plant community produces about 3,600 pounds of air-dry vegetation in years of above-normal precipitation and 2,800 pounds in years of below-normal precipitation.

This soil is suited to seeding of adapted grasses and forbs. Seedbed preparation and planting on the contour or across the slope, where practical, helps to control water erosion.

The Adel soil is well suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian crabapple, green ash, Siberian elm, white willow, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and cotoneaster.

The main limitations for homesite development on this soil are moderate permeability, potential frost action, and low soil strength. If the soil is used for septic tank absorption fields, the moderate permeability can be overcome by increasing the size of the absorption field. Frost action and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations.

This map unit is in capability subclass IVe, nonirrigated, and in Silty range site, 20- to 24-inch precipitation zone.

11—Adel-Cheadle complex, 15 to 45 percent slopes. This map unit is on fans, foot slopes, ridges, and hills in the south-central part of the county. Slopes commonly are 250 to 1,000 feet long. Elevation is 4,700 to 6,500 feet. The average annual precipitation is about 22 inches, the average annual air temperature is about 40 degrees F, and the average frost-free period is about 70 days.

This unit is about 60 percent Adel loam and 30 percent Cheadle flaggy loam. The Adel soil is on fans

and foot slopes below areas of the Cheadle soil, and the Cheadle soil is on ridges and hills.

Included in this unit is about 10 percent moderately deep Teton soils on backslopes.

The Adel soil is deep and well drained. It formed in alluvium and colluvium derived dominantly from sandstone. Typically, the surface layer is dark gray loam about 13 inches thick. The next layer is a dark grayish brown and grayish brown loam about 25 inches thick. The subsoil to a depth of 60 inches or more is brown channery loam.

Permeability of the Adel soil is moderate. Available water capacity is high. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is 60 inches or more. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

The Cheadle soil is shallow and well drained. It formed in residuum derived dominantly from fractured hard sandstone. Typically, the surface layer is dark grayish brown flaggy loam about 7 inches thick. The upper 8 inches of the substratum is brown extremely channery loam. The lower part, to a depth of 19 inches, is light yellowish brown extremely flaggy loam. Very pale brown sandstone is at a depth of 19 inches. Depth to sandstone ranges from 10 to 20 inches.

Permeability of the Cheadle soil is moderate. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. The average annual wetting depth where this soil is under native vegetation is 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

The soils in this unit are used as rangeland.

These soils are poorly suited to cultivated crops and to hay and pasture because of steepness of slope and rough topography.

The potential plant community on the Adel soil is mainly rough fescue, mountain brome, bluebunch wheatgrass, and Columbia needlegrass. If the range is excessively grazed, the proportion of these plants decreases and the proportion of Idaho fescue, western wheatgrass, Letterman needlegrass, and spikeoat increases. If excessive grazing continues, plants such as Kentucky bluegrass, timothy, onespike danthonia, and perennial forbs may invade. The potential plant community produces about 3,600 pounds of air-dry vegetation in years of above-normal precipitation and 2,800 pounds in years of below-normal precipitation.

The potential plant community on the Cheadle soil is mainly bluebunch wheatgrass, rough fescue, Columbia needlegrass, and western wheatgrass. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of Idaho fescue, prairie junegrass, western wheatgrass, and timber oatgrass increases. If excessive grazing continues, plants such as onespike danthonia, perennial forbs, broom snakeweed, and annuals may invade. The potential plant community produces about 2,100 pounds of air-dry vegetation in years of above-normal precipitation and 1,300 pounds in years of below-normal precipitation.

The surface layer is susceptible to water erosion and soil blowing if it is disturbed or the range is overgrazed. These soils are not suited to mechanical treatment because of slope and rough topography.

These soils are poorly suited to windbreaks. They are limited mainly by slope.

The soils in this unit are poorly suited to homesite development. The main limitations of the Adel soil are moderate permeability, slope, potential frost action, and low soil strength. Slope is a concern in installing septic tank absorption fields. Absorption lines should be installed on the contour. The moderate permeability can be overcome by increasing the size of the absorption field. Frost action and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations.

The main limitations for homesite development on the Cheadle soil are steepness of slope and the shallow depth to bedrock.

This map unit is in capability subclass VIe, nonirrigated. The Adel soil is in Silty range site, 20- to 24-inch precipitation zone, and the Cheadle soil is in Shallow range site, 20- to 24-inch precipitation zone.

12—Adger-Nobe clays, 0 to 2 percent slopes. This map unit is on terraces and fans in the central and western parts of the county. Slopes commonly are 250 to 1,000 feet long. Elevation is 3,400 to 4,000 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 120 days.

This unit is about 60 percent Adger clay and 30 percent Nobe clay.

Included in this unit is about 10 percent deep Daglum soils that are salt- and alkali-affected.

The Adger soil is deep and moderately well drained. It formed in alluvium derived dominantly from shale. Typically, the surface layer is grayish brown clay about 6 inches thick. The upper 3 inches of the subsoil is dark grayish brown clay, the next 5 inches is grayish brown clay, and the lower 23 inches is dark grayish brown clay. The substratum to a depth of 60 inches or more is olive brown clay.

Permeability of the Adger soil is very slow. Available water capacity is moderate to low. This soil is salt- or alkali-affected in the subsoil and substratum. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is about 26 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high.

The Nobe soil is deep and moderately well drained. It formed in alluvium derived from mixed rock sources.

Typically, the surface layer is light gray fine sandy loam about 1 inch thick. The subsoil is grayish brown clay about 7 inches thick. The upper 16 inches of the substratum is light olive gray clay, and the lower part to a depth of 60 inches or more is olive gray clay.

Permeability of the Nobe soil is very slow. Available water capacity is low. This soil is salt- and alkali-affected in the subsoil and substratum. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is about 22 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high.

The soils in this unit are used as rangeland.

These soils are poorly suited to cultivated crops and to hay and pasture because of the high content of salt and alkali in the subsoil and substratum.

The potential plant community on the Adger soil is mainly western wheatgrass, green needlegrass, thickspike wheatgrass, and Nuttall saltbush. If the range is excessively grazed, the proportion of these plants decreases and the proportion of Sandberg bluegrass, bottlebrush squirreltail, sand dropseed, and big sagebrush increases. If excessive grazing continues, plants such as foxtail barley, pricklypear, tumblegrass, and annual saltbush may invade. The potential plant community produces about 800 pounds of air-dry vegetation in years of above-normal precipitation and 400 pounds in years of below-normal precipitation.

The potential plant community on the Nobe soil is mainly western wheatgrass, bottlebrush squirreltail, alkaligrass, and Nuttall saltbush. If the range is excessively grazed, the proportion of these plants decreases and the proportion of Sandberg bluegrass, inland saltgrass, big sagebrush, and black greasewood increases. If excessive grazing continues, plants such as foxtail barley, seepweed, glasswort, and annuals may invade. The potential plant community produces about 200 pounds of air-dry vegetation in years of above-normal precipitation and 75 pounds in years of below-normal precipitation.

These soils are suited to mechanical treatment.

The Adger soil is poorly suited to windbreaks. It is strongly saline, which limits the choice of trees and shrubs to Russian-olive and silver buffaloberry. Summer fallow, cultivation for weed control, and selection of adapted plants are needed to insure establishment and survival of seedlings.

The Nobe soil is very poorly suited to windbreaks. It is limited mainly by the high content of salt and alkali.

The main limitations for homesite development on the soils in this unit are very slow permeability, salinity, shrink-swell potential, corrosivity to concrete, and low soil strength. If the soils are used for septic tank absorption fields, the very slow permeability can be overcome by increasing the size of the absorption field or by excavating the trench to a suitable depth. The field or trench should be backfilled with gravel. Shrinking and swelling and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential. Use of salt-resistant concrete helps to overcome the limitation of corrosivity.

This map unit is in capability subclass VIs, nonirrigated. The Adger soil is in Dense Clay range site, 15- to 19-inch precipitation zone, and the Nobe soil is in Saline Uplands range site, 15- to 19-inch precipitation zone.

13—Adger-Nobe clays, 2 to 8 percent slopes. This map unit is on terraces and fans in the central and western parts of the county. Slopes commonly are 250 to 1,000 feet long. Elevation is 3,400 to 4,000 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 120 days.

This unit is about 55 percent Adger clay and 30 percent Nobe clay.

Included in this unit is about 15 percent deep Daglum soils that are salt- and alkali-affected.

The Adger soil is deep and moderately well drained. It formed in alluvium derived dominantly from shale. Typically, the surface layer is grayish brown clay about 6 inches thick. The upper 3 inches of the subsoil is dark grayish brown clay, the next 5 inches is grayish brown clay, and the lower 23 inches is dark grayish brown clay. The substratum to a depth of 60 inches or more is olive brown clay.

Permeability of the Adger soil is very slow. Available water capacity is moderate to low. This soil is salt- and alkali-affected in the subsoil and substratum. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is about 26 inches. Runoff is slow, and the hazard of water erosion is moderate. The hazard of soil blowing is high.

The Nobe soil is deep and moderately well drained. It formed in alluvium derived from mixed rock sources. Typically, the surface layer is light gray fine sandy loam about 1 inch thick. The subsoil is grayish brown clay about 7 inches thick. The upper 16 inches of the substratum is light olive gray clay, and the lower part to a depth of 60 inches or more is olive gray clay.

Permeability of the Nobe soil is very slow. Available water capacity is low. This soil is salt- and alkali-affected in the subsoil and substratum. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is about 22 inches. Runoff is slow, and the hazard of water erosion is moderate. The hazard of soil blowing is high.

The soils in this unit are used as rangeland.

These soils are poorly suited to cultivated crops and to hay and pasture because of the high content of salt and alkali in the subsoil and substratum.

The potential plant community on the Adger soil is mainly western wheatgrass, green needlegrass, thickspike wheatgrass, and Nuttall saltbush. If the range is excessively grazed, the proportion of these plants decreases and the proportion of Sandberg bluegrass, bottlebrush squirreltail, sand dropseed, and big sagebrush increases. If excessive grazing continues, plants such as foxtail barley, pricklypear, tumblegrass, and annual saltbush may invade. The potential plant community produces about 800 pounds of air-dry vegetation in years of above-normal precipitation and 400 pounds in years of below-normal precipitation.

The potential plant community on the Nobe soil is mainly western wheatgrass, bottlebrush squirreltail, alkaligrass, and Nuttall saltbush. If the range is excessively grazed, the proportion of these plants decreases and the proportion of Sandberg bluegrass, inland saltgrass, big sagebrush, and black greasewood increases. If excessive grazing continues, plants such as foxtail barley, seepweed, glasswort, and annuals may invade. The potential plant community produces about 200 pounds of air-dry vegetation in years of above-normal precipitation and 75 pounds in years of below-normal precipitation.

These soils are suited to mechanical treatment. To control erosion and conserve moisture, mechanical treatment should be on the contour or across the slope where practical.

The Adger soil is poorly suited to windbreaks. It is strongly saline, which limits the choice of trees and shrubs to Russian-olive and silver buffaloberry. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings.

The Nobe soil is very poorly suited to windbreaks. It is limited mainly by the high content of salt and alkali.

The soils in this unit are poorly suited to homesite development. The main limitations are very slow permeability, salinity, shrink-swell potential, corrosivity to concrete, and low soil strength. If these soils are used for septic tank absorption fields, the very slow permeability can be overcome by increasing the size of the absorption field or by excavating the trench to a suitable depth. The field or trench should be backfilled with gravel. Shrinking and swelling and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential. Use of salt-resistant concrete helps to overcome the corrosivity.

This map unit is in capability subclass VIs, nonirrigated. The Adger soil is in Dense Clay range site, 15- to 19-inch precipitation zone, and the Nobe soil is in Saline Uplands range site, 15- to 19-inch precipitation zone.

14—Alder clay loam, 2 to 8 percent slopes. This moderately deep, well drained soil is on uplands in the south-central part of the county. It formed in residuum or alluvium derived from semiconsolidated shale interbedded with sandstone. Slopes commonly are 250 to 1,000 feet long. Elevation is 4,100 to 4,800 feet. The average annual precipitation is about 19 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 100 days.

Included in this unit are small areas of moderately deep Hibar soils and shallow Castner soils.

Typically, the surface layer of this Alder soil is dark gray loam about 3 inches thick. The next layer is dark gray clay loam about 5 inches thick. The upper 7 inches of the subsoil is brown silty clay, the next 6 inches is light yellowish brown silty clay, and the lower 10 inches is very pale brown and yellow clay loam. White consolidated shale interbedded with sandstone is at a depth of 31 inches. Depth to bedrock ranges from 20 to 40 inches.

Permeability is moderately slow. Available water capacity is low to moderate. Effective rooting depth is about 20 to 40 inches. The average annual wetting depth where this soil is under native vegetation is 20 to 40 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

This soil is used for nonirrigated crops, mainly wheat, barley, oats, alfalfa, and grass for hay and pasture. It is also used as rangeland.

This soil is well suited to nonirrigated crops. It is limited mainly by the short growing season and the hazards of water erosion and soil blowing. Minimum tillage, contour cultivation, grassed waterways, stubble mulch tillage, and growing sod crops such as hay and pasture help to control soil blowing and water erosion.

The potential plant community on this soil is mainly rough fescue, bluebunch wheatgrass, green needlegrass, and western wheatgrass. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of Idaho fescue, western wheatgrass, needleandthread, and blue grama increases. If excessive grazing continues, plants such as timothy, Kentucky bluegrass, clubmoss, and perennial weeds may invade. The potential plant community produces about 2,400 pounds of air-dry vegetation in years of above-normal precipitation and 1,900 pounds in years of below-normal precipitation.

This soil is suited to seeding of adapted grasses and forbs if the range is in poor condition. Seedbed preparation and planting on the contour or across the

slope, where practical, conserve moisture and help to control water erosion.

This soil is suited to windbreaks, but the low to moderate available water capacity limits the growth of both trees and shrubs. Suitable trees for planting are Russian-olive, Siberian crabapple, green ash, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and cotoneaster. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings.

The main limitations for homesite development on this soil are moderately slow permeability, depth to shale and sandstone, shrink-swell potential, potential frost action, and low soil strength. This soil is severely limited for septic tank absorption fields because of the moderately slow permeability and moderate depth to shale and sandstone. Cuts to level building sites can expose shale and sandstone. Shrinking and swelling, frost action, and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential.

This map unit is in capability subclass IIIe, nonirrigated, and in Silty range site, 15- to 19-inch precipitation zone.

15—Alder clay loam, 8 to 15 percent slopes. This moderately deep, well drained soil is on uplands in the south-central part of the county. It formed in residuum or alluvium derived from semiconsolidated shale interbedded with sandstone. Slopes commonly are 250 to 1,000 feet long. Elevation is 4,100 to 4,800 feet. The average annual precipitation is about 19 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 100 days.

Included in this unit are small areas of shallow Castner soils on knolls.

Typically, the surface layer of this Alder soil is dark gray loam about 3 inches thick. The next layer is dark gray clay loam about 5 inches thick. The upper 7 inches of the subsoil is brown silty clay, the next 6 inches is light yellowish brown silty clay, and the lower 10 inches is very pale brown and yellow clay loam. White consolidated shale interbedded with sandstone is at a depth of 31 inches. Depth to shale and sandstone ranges from 20 to 40 inches.

Permeability is moderately slow. Available water capacity is low to moderate. Effective rooting depth is 20 to 40 inches. The average annual wetting depth where this soil is under native vegetation is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

This soil is used for nonirrigated crops, mainly wheat, barley, oats, alfalfa, and grass for hay and pasture. It is also used as rangeland.

This soil is well suited to nonirrigated crops. It is limited mainly by the hazards of water erosion and soil blowing and the short growing season. Minimum tillage, contour cultivation, grassed waterways, stubble-mulch tillage, and growing sod crops such as hay and pasture help to control soil blowing and water erosion.

The potential plant community on this soil is mainly rough fescue, bluebunch wheatgrass, green needlegrass, and western wheatgrass. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of western wheatgrass, Idaho fescue, needleandthread, and blue grama increases. If excessive grazing continues, plants such as timothy, Kentucky bluegrass, clubmoss, and perennial weeds may invade. The potential plant community produces about 2,400 pounds of air-dry vegetation in years of above-normal precipitation and 1,900 pounds in years of below-normal precipitation.

This soil is suited to seeding of adapted grasses and forbs if the range is in poor condition. Seedbed preparation and planting on the contour or across the slope, where practical, conserve moisture and help to control water erosion.

This soil is suited to windbreaks, but the low to moderate available water capacity limits the growth of both trees and shrubs. Suitable trees for planting are Russian-olive, Siberian crabapple, green ash, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and cotoneaster. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings. Planting on the contour helps to conserve moisture.

The main limitations for homesite development on this soil are moderately slow permeability, depth to shale and sandstone, shrink-swell potential, potential frost action, and low soil strength. This soil is severely limited for septic tank absorption fields because of the moderately slow permeability and moderate depth to shale and sandstone. Cuts to level building sites can expose shale and sandstone. Shrinking and swelling, frost action, and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential.

This map unit is in capability subclass IVe, nonirrigated, and in Silty range site, 15- to 19-inch precipitation zone.

16—Alder-Winifred clay loams, 15 to 45 percent slopes. This map unit is on uplands in the south-central part of the county. Slopes commonly are 250 to 1,000 feet long. Elevation is 4,100 to 4,700 feet. The average annual precipitation is about 19 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 100 days.

This unit is about 50 percent Alder clay loam and 35 percent Winifred clay loam. The Alder soil is on plane and concave side slopes, and the Winifred soil is on convex side slopes.

Included in this unit is about 15 percent shallow Castner soils at various levels on the slopes.

The Alder soil is moderately deep and well drained. It formed in residuum and alluvium derived dominantly from semiconsolidated shale interbedded with sandstone. Typically, the surface layer is dark gray loam about 3 inches thick. The next layer is dark gray clay loam about 5 inches thick. The upper 7 inches of the subsoil is brown silty clay, the next 6 inches is light yellowish brown silty clay, and the lower 10 inches is very pale brown and yellow clay loam. White consolidated shale interbedded with sandstone is at a depth of about 31 inches. Depth to shale and sandstone ranges from 20 to 40 inches.

Permeability of the Alder soil is moderately slow. Available water capacity is low to moderate. Effective rooting depth is 20 to 40 inches. The average annual wetting depth where this soil is under native vegetation is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

The Winifred soil is moderately deep and well drained. It formed in alluvium and residuum derived dominantly from semiconsolidated shale. Typically, the surface layer is dark grayish brown clay loam about 6 inches thick. The upper 8 inches of the subsoil is grayish brown silty clay, and the lower 18 inches is grayish brown clay. Light brownish gray and yellowish brown shale is at a depth of 32 inches. Depth to shale ranges from 20 to 40 inches.

Permeability of the Winifred soil is slow. Available water capacity is moderate. Effective rooting depth is 20 to 40 inches. The average annual wetting depth where this soil is under native vegetation is 26 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

The soils in this unit are used as rangeland.

These soils are poorly suited to cultivated crops and to hay and pasture because of steepness of slope and rough topography.

The potential plant community on the Alder soil is mainly rough fescue, bluebunch wheatgrass, green needlegrass, and western wheatgrass. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of Idaho fescue, western wheatgrass, needleandthread, and blue grama increases. If excessive grazing continues, plants such as timothy, Kentucky bluegrass, clubmoss, and perennial weeds may invade. The potential plant community produces about 2,400 pounds of air-dry vegetation in years of above-normal precipitation and 1,900 pounds in years of below-normal precipitation.

The potential plant community on the Winifred soil is mainly Idaho fescue, bluebunch wheatgrass, green needlegrass, and western wheatgrass. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of Sandberg bluegrass, Idaho fescue, plains reedgrass, and blue grama increases. If excessive grazing continues, plants such as annuals, Kentucky bluegrass, broom snakeweed, and perennial weeds may invade. The potential plant community produces about 2,300 pounds of air-dry vegetation in years of above-normal precipitation and 1,700 pounds in years of below-normal precipitation.

These soils are not suited to mechanical treatment because of slope and rough topography. The surface layer is susceptible to water erosion if it is disturbed or if the range is overgrazed.

These soils are poorly suited to windbreaks. They are limited mainly by slope.

The main limitations for homesite development on these soils are slow and moderately slow permeability, slope, moderate depth to shale and sandstone, shrink-swell potential, potential frost action, and low soil strength. These soils are severely limited for septic tank absorption fields because of the slow and moderately slow permeability, slope, and moderate depth to shale and sandstone. Cuts to level building sites can expose shale and sandstone. Shrinking and swelling, frost action, and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential.

This map unit is in capability subclass VIe, nonirrigated. The Alder soil is in Silty range site, 15- to 19-inch precipitation zone, and the Winifred soil is in Clayey range site, 15- to 19-inch precipitation zone.

17—Amherst-Absarokee clay loams, 2 to 8 percent slopes. This map unit is on uplands in the central part of the county. Slopes commonly are 250 to 1,000 feet long. Elevation is 3,000 to 4,600 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 120 days.

This unit is about 50 percent Amherst clay loam and 30 percent Absarokee clay loam. The Amherst soil is on convex side slopes, and the Absarokee soil is on plane and concave side slopes.

Included in this unit are small areas of moderately deep Borky soils and shallow Sinnigam soils. Included areas make up about 20 percent of the total acreage.

The Amherst soil is shallow and well drained. It formed in residuum derived dominantly from consolidated shale interbedded with sandstone. Typically, the surface layer is grayish brown clay loam about 2 inches thick. The upper 3 inches of the subsoil is grayish brown channery clay, and the lower 7 inches is brown channery clay. Light brownish gray consolidated shale and sandstone are at a depth of 12 inches. Depth to shale and sandstone ranges from 10 to 20 inches.

Permeability of the Amherst soil is moderately slow. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. The average annual wetting depth where this soil is under native vegetation is 10 to 20 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

The Absarokee soil is moderately deep and well drained. It formed in residuum derived dominantly from consolidated shale interbedded with sandstone. Typically, the surface layer is grayish brown clay loam about 7 inches thick. The upper 8 inches of the subsoil is brown silty clay, and the lower 3 inches is light brownish gray clay loam. The substratum is light gray clay loam about 8 inches thick. Light gray shale and sandstone are at a depth of about 26 inches. Depth to shale and sandstone ranges from 20 to 40 inches.

Permeability of the Absarokee soil is moderately slow. Available water capacity is low. Effective rooting depth is 20 to 40 inches. The average annual wetting depth where this soil is under native vegetation is 20 to 30 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

The soils in this unit are used for nonirrigated crops, mainly wheat, barley, oats, alfalfa, and grass for hay and pasture. They are also used as rangeland.

These soils are suited to nonirrigated crops. They are limited mainly by the shallow depth, the very low available water capacity of the Amherst soil, and the hazards of water erosion and soil blowing. Minimum tillage, contour cultivation, grassed waterways, stripcropping, and growing sod crops such as hay and pasture help to control soil blowing and water erosion. Tall grass barriers trap snow, which increases the amount of moisture in the soil.

The potential plant community on the Amherst soil is mainly rough fescue, green needlegrass, bluebunch wheatgrass, and plains muhly. If the range is excessively grazed, the proportion of these plants decreases and the proportion of Idaho fescue, blue grama, needleandthread, and prairie junegrass increases. If excessive grazing continues, plants such as clubmoss, annuals, Kentucky bluegrass, and perennial weeds may invade. The potential plant community produces about 1,500 pounds of air-dry vegetation in years of above-normal precipitation and 900 pounds in years of below-normal precipitation.

The potential plant community on the Absarokee soil is mainly rough fescue, bluebunch wheatgrass, green needlegrass, and western wheatgrass. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of needleandthread, Idaho fescue, western wheatgrass, and blue grama increases. If excessive grazing continues, plants such as timothy, Kentucky bluegrass, clubmoss, and perennial weeds may invade. The potential plant community produces about 2,400 pounds of air-dry vegetation in years of above-normal precipitation and 1,900 pounds in years of below-normal precipitation.

These soils are suitable for seeding to adapted grasses and forbs if the range is in poor condition. Seedbed preparation and planting on the contour or across the slope, where practical, help to control water erosion and to conserve moisture.

The Amherst soil is poorly suited to windbreaks. It is limited mainly by the very low available water capacity.

The Absarokee soil is suited to windbreaks, but the low available water capacity limits the growth of both trees and shrubs. Suitable trees for planting are Russian-olive, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, western sandcherry, and skunkbush sumac. Planting on the contour helps to conserve moisture. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings.

The main limitations for homesite development on the soils in this unit are moderately slow permeability, shallow and moderate depth to shale and sandstone, shrink-swell potential, and low soil strength. These soils are severely limited for septic tank absorption fields because of the moderately slow permeability and shallow and moderate depth to shale and sandstone. Cuts to level building sites can expose shale and sandstone. Shrinking and swelling and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential.

This map unit is in capability subclass IVe, nonirrigated. The Amherst soil is in Shallow range site, 15- to 19-inch precipitation zone, and the Absarokee soil is in Silty range site, 15- to 19-inch precipitation zone.

18—Amherst-Absarokee clay loams, 8 to 25 percent slopes. This map unit is on uplands. Slopes commonly are less than 250 feet long. Elevation is 3,000 to 4,600 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about

43 degrees F, and the average frost-free period is about 120 days.

This unit is about 60 percent Amherst clay loam and 20 percent Absarokee clay loam. The Amherst soil is on ridges and knolls, and the Absarokee soil is on plane slopes below areas of the Amherst soil.

Included in this unit are small areas of shallow Sinnigam and Castner soils on ridges. Included areas make up about 20 percent of the total acreage.

The Amherst soil is shallow and well drained. It formed in residuum derived dominantly from consolidated shale interbedded with sandstone. Typically, the surface layer is grayish brown clay loam about 2 inches thick. The upper 3 inches of the subsoil is grayish brown channery clay, and the lower 7 inches is brown channery clay. Light brownish gray consolidated shale and sandstone are at a depth of 12 inches. Depth to shale and sandstone ranges from 10 to 20 inches.

Permeability of the Amherst soil is moderately slow. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. The average annual wetting depth where this soil is under native vegetation is 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

The Absarokee soil is moderately deep and well drained. It formed in residuum derived dominantly from consolidated shale interbedded with sandstone. Typically, the surface layer is grayish brown clay loam about 7 inches thick. The upper 8 inches of the subsoil is brown silty clay, and the lower 3 inches is light brownish gray clay loam. The substratum is light gray clay loam about 8 inches thick. Light gray consolidated shale and sandstone are at a depth of about 26 inches. Depth to shale and sandstone ranges from 20 to 40 inches.

Permeability of the Absarokee soil is moderately slow. Available water capacity is low. Effective rooting depth is 20 to 40 inches. The average annual wetting depth where this soil is under native vegetation is 20 to 30 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

The soils in this unit are used as rangeland.

These soils are poorly suited to cultivated crops and to hay and pasture because of the steepness of slope, the hazard of water erosion, and the shallow depth to bedrock in the Amherst soil.

The potential plant community on the Amherst soil is mainly western wheatgrass, green needlegrass, bluebunch wheatgrass, and plains muhly. If the range is excessively grazed, the proportion of these plants decreases and the proportion of Idaho fescue, blue grama, needleandthread, and prairie junegrass increases. If excessive grazing continues, plants such as clubmoss, annuals, Kentucky bluegrass, and perennial weeds may invade. The potential plant community produces about 1,500 pounds of air-dry vegetation in years of above-normal precipitation and 900 pounds in years of below-normal precipitation.

The potential plant community on the Absarokee soil is mainly rough fescue, bluebunch wheatgrass, green needlegrass, and western wheatgrass. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of needleandthread, Idaho fescue, western wheatgrass, and blue grama increases. If excessive grazing continues, plants such as timothy, Kentucky bluegrass, clubmoss, and perennial weeds may invade. The potential plant community produces about 2,400 pounds of air-dry vegetation in years of above-normal precipitation and 1,900 pounds in years of below-normal precipitation.

These soils are suitable for seeding to adapted grasses and forbs if the range is in poor condition. Seedbed preparation and planting on the contour or across the slope, where practical, help to control water erosion and to conserve moisture.

The Amherst soil is poorly suited to windbreaks. It is limited mainly by the very low available water capacity.

The Absarokee soil, where slopes are 8 to 15 percent, is suited to windbreaks, but the low available water capacity of this soil limits the growth of both trees and shrubs. Suitable trees for planting are Russian-olive, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, western sandcherry, and skunkbush sumac. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings. Planting on the contour helps to conserve moisture. Where the Absarokee soil has slopes of 15 to 25 percent, it is poorly suited to windbreaks.

The main limitations for homesite development on the soils in this unit are moderately slow permeability, slope, shallow and moderate depth to shale and sandstone, shrink-swell potential, content of rock fragments, and low soil strength. The soils are severely limited for septic tank absorption fields because of the moderately slow permeability, slope, and shallow and moderate depth to shale and sandstone. Cuts to level building sites can expose shale and sandstone. Shrinking and swelling and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential.

This map unit is in capability subclass VIe, nonirrigated. The Amherst soil is in Shallow range site, 15- to 19-inch precipitation zone, and the Absarokee soil is in Silty range site, 15- to 19-inch precipitation zone.

19—Amor loam, 2 to 8 percent slopes. This moderately deep and well drained soil is on uplands in the western part of the county. It formed in residuum

derived dominantly from weakly consolidated sandy and silty sedimentary beds. Slopes commonly are 250 to 1,000 feet long. Elevation is 3,400 to 4,200 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 120 days.

Included in this unit are small areas of shallow Cabba soils and moderately deep Doney soils.

Typically, the surface layer of this Amor soil is grayish brown loam about 7 inches thick. The subsoil is brown and very pale brown loam about 12 inches thick. The substratum is very pale brown loam about 8 inches thick. Light gray, weakly consolidated, sandy and silty sedimentary beds are at a depth of 27 inches. Depth to sedimentary beds ranges from 20 to 40 inches.

Permeability is moderate. Available water capacity is low to moderate. Effective rooting depth is 20 to 40 inches. The average annual wetting depth where this soil is under native vegetation is 20 to 27 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

This soil is used for nonirrigated crops, mainly wheat, barley, oats, alfalfa, and grass for hay and pasture. It is also used as rangeland.

This soil is well suited to nonirrigated crops. It is limited mainly by the low to moderate available water capacity, low precipitation, and the hazards of soil blowing and water erosion. Minimum tillage, contour cultivation, grassed waterways, stripcropping, and growing sod crops such as hay and pasture help to control soil blowing and water erosion.

The potential plant community on this soil is mainly bluebunch wheatgrass, green needlegrass, western wheatgrass, and needleandthread. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of western wheatgrass, needleandthread, Sandberg bluegrass, and blue grama increases. If excessive grazing continues, plants such as Kentucky bluegrass, timothy, clubmoss, and perennial weeds may invade. The potential plant community produces about 1,800 pounds of air-dry vegetation in years of above-normal precipitation and 800 pounds in years of below-normal precipitation.

The soils are suitable for seeding to adapted grasses and forbs if the range is in poor condition. Seedbed preparation and planting on the contour or across the slope, where practical, help to control water erosion and to conserve moisture.

This soil is suited to windbreaks. The low to moderate available water capacity of the soil limits the growth of both trees and shrubs. Suitable trees for planting are Russian-olive, green ash, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, western sandcherry, and skunkbush sumac. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings. Planting on the contour helps to conserve moisture.

The main limitations for homesite development on this soil are depth to sedimentary beds, potential frost action, and low soil strength. The soil is severely limited for septic tank absorption fields because of slow permeability of the underlying sedimentary beds. Frost action and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations.

This map unit is in capability subclass IIIe, nonirrigated, and in Silty range site, 15- to 19-inch precipitation zone.

20—Amor-Cabba loams, 4 to 8 percent slopes. This map unit is on uplands in the northwestern part of the county. Slopes commonly are 250 to 1,000 feet long. Elevation is 3,400 to 4,200 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 120 days.

This unit is about 60 percent Amor loam and about 30 percent Cabba loam. The Amor soil is on plane side slopes, and the Cabba soil is on knolls and ridges.

Included in this unit are small areas of moderately deep Doney soils on side slopes of ridges and deep Farnuf soils on fans and foot slopes. Included areas make up about 10 percent of the total acreage.

The Amor soil is moderately deep and well drained. It formed in residuum derived dominantly from weakly consolidated, sandy and silty sedimentary beds. Typically, the surface layer is grayish brown loam about 7 inches thick. The subsoil is brown and very pale brown loam about 12 inches thick. The substratum is very pale brown loam about 8 inches thick. Light gray, weakly consolidated, sandy and silty sedimentary beds are at a depth of 27 inches. Depth to sedimentary beds ranges from 20 to 40 inches.

Permeability of the Amor soil is moderate. Available water capacity is low to moderate. Effective rooting depth is 20 to 40 inches. The average annual wetting depth where this soil is under native vegetation is 20 to 27 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

The Cabba soil is shallow and well drained. It formed in residuum derived dominantly from weakly consolidated, sandy and silty sedimentary beds. Typically, the surface layer is grayish brown loam about 2 inches thick. The next layer is a pale brown loam about 6 inches thick. The underlying material is yellow channery loam about 7 inches thick. Very pale brown, weakly consolidated, sandy and silty sedimentary beds are at a depth of 15 inches. Depth to sedimentary beds ranges from 10 to 20 inches.

Permeability of the Cabba soil is moderate. Available water capacity is very low. Effective rooting depth is 10

to 20 inches. The average annual wetting depth where this soil is under native vegetation is 10 to 20 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high.

The soils in this unit are used for nonirrigated crops, mainly wheat, barley, oats, alfalfa, and grass for hay and pasture. They are also used as rangeland.

The soils in this unit are suited to nonirrigated crops. They are limited mainly by the moderate to very low available water capacity, low precipitation, and the hazards of soil blowing and water erosion. Crops that are tolerant of drought are most suitable because the available moisture is not adequate for good growth of most other crops. Minimum tillage, contour cultivation, grassed waterways, stripcropping, and growing sod crops such as hay and pasture help to control soil blowing and water erosion.

The potential plant community on the Amor soil is mainly bluebunch wheatgrass, green needlegrass, western wheatgrass, and needleandthread. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of western wheatgrass, needleandthread, Sandberg bluegrass, and blue grama increases. If excessive grazing continues, plants such as Kentucky bluegrass, timothy, clubmoss, and perennial weeds may invade. The potential plant community produces about 1,800 pounds of air-dry vegetation in years of above-normal precipitation and 800 pounds in years of below-normal precipitation.

The potential plant community on the Cabba soil is mainly bluebunch wheatgrass, western wheatgrass, needleandthread, and prairie junegrass. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of needleandthread, blue grama, fringed sagewort, and threadleaf sedge increases. If excessive grazing continues, plants such as Kentucky bluegrass, broom snakeweed, clubmoss, and perennial weeds may invade. The potential plant community produces about 900 pounds of air-dry vegetation in years of above-normal precipitation and 400 pounds in years of below-normal precipitation.

These soils are suited to seeding of adapted grasses and forbs if the range is in poor condition. Seedbed preparation and planting on the contour or across the slope, where practical, help to control water erosion and to conserve moisture.

The Amor soil is suited to windbreaks, but the low to moderate available water capacity of the soil limits the growth of both trees and shrubs. Suitable trees for planting are Russian-olive, green ash, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, western sandcherry, and skunkbush sumac. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings. Planting on the contour helps to conserve moisture.

The Cabba soil is poorly suited to windbreaks. It is limited mainly by very low available water capacity.

The main limitations for homesite development on these soils are depth to sedimentary beds, potential frost action, and low soil strength. The soils are severely limited for septic tank absorption fields because of slow permeability of the underlying sedimentary beds. Frost action and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations.

This map unit is in capability subclass IVe, nonirrigated. The Amor soil is in Silty range site, 15- to 19-inch precipitation zone, and the Cabba soil is in Shallow range site, 15- to 19-inch precipitation zone.

21—Amor-Winifred complex, 8 to 15 percent slopes. This map unit is on uplands in the central and northwestern parts of the county. Slopes commonly are 250 to 1,000 feet long. Elevation is 3,500 to 4,200 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 120 days.

This unit is about 50 percent Amor loam and 30 percent Winifred clay loam.

Included in this unit are small areas of moderately deep Doney soils on side slopes of ridges and shallow Cabba and Wayden soils on ridges and knolls. Included areas make up about 20 percent of the total acreage.

The Amor soil is moderately deep and well drained. It formed in loamy residuum derived dominantly from weakly consolidated, sandy and silty sedimentary beds. Typically, the surface layer is grayish brown loam about 7 inches thick. The subsoil is brown and very pale brown loam about 12 inches thick. The substratum is very pale brown loam about 8 inches thick. Light gray, weakly consolidated, sandy and silty sedimentary beds are at a depth of 27 inches. Depth to sedimentary beds ranges from 20 to 40 inches.

Permeability of the Amor soil is moderate. Available water capacity is low to moderate. Effective rooting depth is 20 to 40 inches. The average annual wetting depth where this soil is under native vegetation is 20 to 27 inches. Runoff is medium, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

The Winifred soil is moderately deep and well drained. It formed in alluvium and residuum derived dominantly from semiconsolidated shale. Typically, the surface layer is dark grayish brown clay loam about 6 inches thick. The subsoil is grayish brown silty clay and clay about 26 inches thick. Light brownish gray and yellowish brown shale is at a depth of about 32 inches. Depth to shale ranges from 20 to 40 inches.

Permeability of the Winifred soil is slow. Available water capacity is moderate to low. Effective rooting depth is 20 to 40 inches. The average annual wetting depth where this soil is under native vegetation is 20 to

26 inches. Runoff is medium, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

The soils in this unit are used mainly as rangeland. They are also used for hay and pasture and for nonirrigated crops such as wheat, barley, and oats.

These soils are suited to nonirrigated crops. They are limited mainly by the low to moderate available water capacity, low precipitation, and the hazards of water erosion and soil blowing. Minimum tillage, contour cultivation, grassed waterways, stubble-mulch tillage, and growing sod crops such as hay and pasture help to control soil blowing and water erosion.

The potential plant community on the Amor soil is mainly bluebunch wheatgrass, green needlegrass, western wheatgrass, and needleandthread. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of western wheatgrass, needleandthread, Sandberg bluegrass, and blue grama increases. If excessive grazing continues, plants such as Kentucky bluegrass, timothy, clubmoss, and perennial weeds may invade. The potential plant community produces about 1,800 pounds of air-dry vegetation in years of above-normal precipitation and 800 pounds in years of below-normal precipitation.

The potential plant community on the Winifred soil is mainly bluebunch wheatgrass, green needlegrass, western wheatgrass, and Idaho fescue. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of Idaho fescue, plains reedgrass, Sandberg bluegrass, and blue grama increases. If excessive grazing continues, plants such as broom snakeweed, Kentucky bluegrass, perennial weeds, and annuals may invade. The potential plant community produces about 2,300 pounds of air-dry vegetation in years of above-normal precipitation and 1,700 pounds in years of below-normal precipitation.

These soils are suitable for seeding to adapted grasses and forbs if the range is in poor condition. Seedbed preparation and planting on the contour or across the slope, where practical, help to control water erosion and to conserve moisture.

These soils are suited to windbreaks, but the moderate to low available water capacity limits the growth of both trees and shrubs. Suitable trees for planting are Russian-olive, green ash, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and cotoneaster. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings. Planting on the contour helps to conserve moisture.

The main limitations for homesite development on the Amor soil are moderate depth to sedimentary beds, potential frost action, and low soil strength. The soil is severely limited for septic tank absorption fields because of slow permeability of the underlying sedimentary beds. Frost action and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations.

The main limitations for homesite development on the Winifred soil are slow permeability, moderate depth to shale, shrink-swell potential, and low soil strength. The soil is severely limited for septic tank absorption fields because of the slow permeability and moderate depth to shale. Cuts to level building sites can expose shale. Shrinking and swelling and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential.

This map unit is in capability subclass IVe, nonirrigated. The Amor soil is in Silty range site, 15- to 19-inch precipitation zone, and the Winifred soil is in Clayey range site, 15- to 19-inch precipitation zone.

22—Ashuelot Variant-Crago complex, 0 to 4 percent slopes. This map unit is on terraces in the southeastern part of the county. Slopes commonly are more than 1,000 feet long. Elevation is 3,600 to 4,200 feet. The average annual precipitation is about 13 inches, the average annual air temperature is about 44 degrees F, and the average frost-free period is about 120 days.

This unit is about 40 percent Ashuelot Variant cobbly clay loam and 35 percent Crago gravelly clay loam.

Included in this unit are areas of deep, nearly level Sanje soils. Also included are small areas of Crago very gravelly loam on ridges. Included areas make up about 25 percent of the total acreage.

The Ashuelot Variant soil is shallow and well drained. It formed in alluvium derived dominantly from limestone. Typically, the surface layer is grayish brown cobbly clay loam about 4 inches thick. The next layer is grayish brown clay loam about 5 inches thick. The upper 6 inches of the underlying material is pale brown extremely gravelly clay loam, the next 9 inches is pale brown lime-cemented rock fragments, and the lower part to a depth of 62 inches or more is very pale brown extremely gravelly loamy sand. The lime-cemented layer is at a depth of 15 inches. Depth to the lime-cemented layer ranges from 15 to 20 inches.

Permeability of the Ashuelot Variant soil is moderate to the lime-cemented layer and very rapid below it. Available water capacity is very low. Effective rooting depth is 15 to 20 inches. The average annual wetting depth where this soil is under native vegetation is 15 to 20 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high.

The Crago soil is deep and well drained. It formed in alluvium derived dominantly from limestone. Typically,

the surface layer is grayish brown gravelly clay loam about 6 inches thick. The subsoil is pale brown very gravelly loam about 7 inches thick. The upper 11 inches of the substratum is very pale brown extremely gravelly loam, and the lower part to a depth of 60 inches or more is light gray extremely gravelly sandy loam.

Permeability of the Crago soil is moderate to a depth of 24 inches and rapid below this depth. Available water capacity is moderate to low. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is about 36 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high.

The soils in this unit are used as rangeland.

These soils are poorly suited to cultivated crops and to hay and pasture because of the shallow depth to the lime-cemented layer in the Ashuelot Variant soil and the very low to moderate available water capacity.

The potential plant community on the Ashuelot Variant soil is mainly bluebunch wheatgrass, green needlegrass, western wheatgrass, and plains muhly. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, blue grama, prairie junegrass, and threadleaf sedge increases. If excessive grazing continues, plants such as annuals, red threeawn, and perennial weeds may invade. The potential plant community produces about 1,000 pounds of air-dry vegetation in years of above-normal precipitation and 500 pounds in years of below-normal precipitation.

The potential plant community on the Crago soil is mainly bluebunch wheatgrass, green needlegrass, western wheatgrass, and needleandthread. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of needleandthread, prairie junegrass, fringed sagewort, and blue grama increases. If excessive grazing continues, plants such as annuals, clubmoss, broom snakeweed, and perennial weeds may invade. The potential plant community produces about 800 pounds of air-dry vegetation in years of above-normal precipitation and 400 pounds in years of below-normal precipitation.

These soils are suitable for seeding to adapted grasses and forbs if the range is in poor condition. Seedbed preparation and planting on the contour or across the slope, where practical, conserve moisture and help to control water erosion.

The Ashuelot Variant soil is poorly suited to windbreaks. It is limited mainly by the very low available water capacity.

The Crago soil is suited to windbreaks, but the high concentration of lime at a depth of less than 15 inches and the limited moisture supply restrict the choice of trees and shrubs. Suitable trees for planting are Russian-olive, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, and skunkbush sumac. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings. Planting on the contour helps to conserve moisture.

The main limitations for homesite development on the Ashuelot Variant soil are the shallow depth to the lime-cemented layer and the content of rock fragments. The hardpan is rippable and therefore is not a serious limitation for most engineering uses. Removal of pebbles and cobbles in disturbed areas is needed for best results when landscaping, particularly in areas used for lawns. Lawn grasses, shrubs, and trees that are not sensitive to lime-induced chlorosis are well suited to use in landscaping. An annual application of iron chelates reduces the chlorosis.

The main limitation for homesite development on the Crago soil is the content of rock fragments. The very gravelly or extremely gravelly material of the Crago soil below a depth of 7 inches is good roadfill. Removal of pebbles and cobbles in disturbed areas is needed for best results when landscaping, particularly in areas used for lawns. Lawn grasses, shrubs, and trees that are not sensitive to lime-induced chlorosis are well suited to use in landscaping. An annual application of iron chelates reduces the chlorosis.

This map unit is in capability subclass VIs, nonirrigated. The Ashuelot Variant soil is in Shallow range site, 10- to 14-inch precipitation zone, and the Crago soil is in Limy range site, 10- to 14-inch precipitation zone.

23—Bitton very stony loam, 15 to 45 percent slopes. This deep, well drained soil is on foot slopes, fans, and terrace edges in the central part of the county. It formed in alluvium and colluvium derived dominantly from sandstone. Slopes commonly are 250 to 1,000 feet long. Elevation is 3,500 to 4,600 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 115 days.

Included in this unit are small areas of deep Brazon soils on plane side slopes and shallow Wayden and Castner soils on ridges.

Typically, the surface layer of this Bitton soil is dark grayish brown very stony loam about 7 inches thick. The next layer is brown channery loam about 4 inches thick. The underlying material to a depth of 60 inches or more is pale brown extremely channery loam.

Permeability is moderate. Available water capacity is moderate to low. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is about 30 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is slight.

This soil is used as rangeland.

This soil is poorly suited to cultivated crops and to hay and pasture because of steepness of slope and rough topography.

The potential plant community on this soil is mainly bluebunch wheatgrass, rough fescue, western wheatgrass, and green needlegrass. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of needleandthread, Idaho fescue, western wheatgrass, and blue grama increases. If excessive grazing continues, plants such as timothy, Kentucky bluegrass, clubmoss, and perennial weeds may invade. The potential plant community produces about 2,200 pounds of air-dry vegetation in years of above-normal precipitation and 1,400 pounds in years of below-normal precipitation.

Mechanical treatment is not practical because the surface is stony and the slopes are steep.

This soil is poorly suited to windbreaks. It is limited mainly by slope.

The main limitations for homesite development on this soil are slope and the content of rock fragments. Slope is a concern in installing septic tank absorption fields. Absorption lines should be installed on the contour. Access roads should be designed to provide adequate cut-slope grade, and drains are needed to control surface runoff and keep soil losses to a minimum.

This map unit is in capability subclass VIe, nonirrigated, and in Silty range site, 15- to 19-inch precipitation zone.

24—Bitton-Winifred-Castner complex, 15 to 60 percent slopes. This map unit is on foot slopes and fans in the central part of the county. Slopes commonly are 250 to 1,000 feet long. Elevation is 3,500 to 4,700 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 115 days.

This unit is about 40 percent Bitton channery loam, 30 percent Winifred clay loam, and 25 percent Castner stony loam. The Bitton soil is on foot slopes and fans, the Winifred soil is on convex side slopes, and the Castner soil is on hilltops. The Bitton and Castner soils have slopes of 15 to 60 percent, and the Winifred soil has slopes of 15 to 45 percent.

Included in this unit is about 5 percent Rock outcrop.

The Bitton soil is deep and well drained. It formed in alluvium and colluvium derived dominantly from sandstone. Typically, the surface layer is dark grayish brown channery loam about 7 inches thick. The next layer is brown channery loam about 4 inches thick. The underlying material to a depth of 60 inches or more is pale brown extremely channery loam.

Permeability of the Bitton soil is moderate. Available water capacity is moderate to low. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is about 30 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

The Winifred soil is moderately deep and well drained. It formed in alluvium and residuum derived dominantly from semiconsolidated shale. Typically, the surface layer is dark grayish brown clay loam about 6 inches thick. The upper 8 inches of the subsoil is grayish brown silty clay, and the lower 18 inches is grayish brown clay. Light brownish gray and yellowish brown shale is at a depth of about 32 inches. Depth to shale ranges from 20 to 40 inches.

Permeability of the Winifred soil is slow. Available water capacity is low to moderate. Effective rooting depth is 20 to 40 inches. The average annual wetting depth where this soil is under native vegetation is about 26 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

The Castner soil is shallow and well drained. It formed in residuum derived dominantly from fractured hard sandstone. Typically, the surface layer is grayish brown stony loam about 7 inches thick. The underlying material is pale brown very stony loam about 7 inches thick. Light gray sandstone is at a depth of 14 inches. Depth to sandstone ranges from 10 to 20 inches.

Permeability of the Castner soil is moderate. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. The average annual wetting depth where this soil is under native vegetation is 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

The soils in this unit are used as rangeland.

These soils are poorly suited to cultivated crops and to hay and pasture because of steepness of slope and rough topography.

The potential plant community on the Bitton soil is mainly rough fescue, bluebunch wheatgrass, green needlegrass, and western wheatgrass. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of Idaho fescue, western wheatgrass, blue grama, and needleandthread increases. If excessive grazing continues, plants such as Kentucky bluegrass, timothy, clubmoss, and perennial weeds may invade. The potential plant community produces about 2,200 pounds of air-dry vegetation in years of above-normal precipitation and 1,400 pounds in years of below-normal precipitation.

The potential plant community on the Winifred soil is mainly Idaho fescue, bluebunch wheatgrass, green needlegrass, and western wheatgrass. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of Sandberg bluegrass, blue grama, Idaho fescue, and plains reedgrass increases. If excessive grazing continues, plants such as Kentucky bluegrass, annuals, perennial weeds, and broom snakeweed may invade. The potential plant community produces about 2,300 pounds of air-dry

vegetation in years of above-normal precipitation and 1,700 pounds in years of below-normal precipitation.

The potential plant community on the Castner soil is mainly western wheatgrass, green needlegrass, bluebunch wheatgrass, and rough fescue. If the range is excessively grazed, the proportion of these plants decreases and the proportion of Idaho fescue, blue grama, needleandthread, and prairie junegrass increases. If excessive grazing continues, plants such as Kentucky bluegrass, clubmoss, perennial weeds, and annuals may invade. The potential plant community produces about 1,200 pounds of air-dry vegetation in years of above-normal precipitation and 800 pounds in years of below-normal precipitation.

Steepness of slope limits access of livestock and promotes overgrazing of the less sloping areas. The surface layer of these soils is susceptible to water erosion and soil blowing if it is disturbed or if the range is overgrazed. These soils are not suited to mechanical treatment because of steepness of slope and rough topography.

These soils are poorly suited to windbreaks. They are limited mainly by slope.

The soils in this unit are poorly suited to homesite development because of the steepness of slope, the moderate depth to shale in the Winifred soil, and the shallow depth to hard sandstone in the Castner soil.

This map unit is in capability subclass VIIe, nonirrigated. The Bitton soil is in Silty range site, 15- to 19-inch precipitation zone, the Winifred soil is in Clayey range site, 15- to 19-inch precipitation zone, and the Castner soil is in Shallow range site, 15- to 19-inch precipitation zone.

25—Borky-Sinnigam channery clay loams, 2 to 8 percent slopes. This map unit is on uplands in the central part of the county. Slopes commonly are 250 to 1,000 feet long. Elevation is 3,500 to 4,700 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 120 days.

This unit is about 45 percent Borky channery clay loam and 30 percent Sinnigam channery clay loam. The Borky soil is on plane side slopes, and the Sinnigam soil is on ridges and knolls.

Included in this unit are small areas of moderately deep Absarokee soils and shallow Amherst and Castner soils. Included areas make up about 25 percent of the total acreage.

The Borky soil is moderately deep and well drained. It formed in residuum derived dominantly from consolidated sandstone interbedded with shale. Typically, the surface layer is dark grayish brown channery clay loam about 5 inches thick. The upper 7 inches of the subsoil is dark brown very stony clay, and the lower 6 inches is brown very stony clay loam. The substratum is light grayish brown very stony clay loam about 18 inches thick. Light gray sandstone and shale are at a depth of 36 inches. Depth to sandstone and shale ranges from 20 to 40 inches.

Permeability of the Borky soil is slow. Available water capacity is low. Effective rooting depth is 20 to 40 inches. The average annual wetting depth where this soil is under native vegetation is 20 to 30 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

The Sinnigam soil is shallow and well drained. It formed in residuum derived dominantly from fractured hard sandstone. Typically, the surface layer is dark brown channery clay loam about 5 inches thick. The subsoil is brown very channery clay loam about 11 inches thick. Pale brown sandstone is at a depth of 16 inches. Depth to hard sandstone ranges from 10 to 20 inches.

Permeability of the Sinnigam soil is moderately slow. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. The average annual wetting depth where this soil is under native vegetation is 10 to 20 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

The soils in this unit are used mainly for nonirrigated crops, such as wheat, barley, and oats, and for hay and pasture. They are also used as rangeland.

These soils are suited to nonirrigated crops. They are limited mainly by the low and very low available water capacity and the hazards of water erosion and soil blowing. Crops that are tolerant of drought are most suitable because the available moisture is not adequate for good growth of most other crops. Minimum tillage, contour cultivation, grassed waterways, stripcropping, and growing sod crops such as hay and pasture help to control soil blowing and water erosion.

The potential plant community on the Borky soil is mainly rough fescue, bluebunch wheatgrass, green needlegrass, and western wheatgrass. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of Idaho fescue, needleandthread, western wheatgrass, and blue grama increases. If excessive grazing continues, plants such as timothy, Kentucky bluegrass, clubmoss, and perennial weeds may invade. The potential plant community produces about 2,000 pounds of air-dry vegetation in years of above-normal precipitation and 1,400 pounds in years of below-normal precipitation.

The potential plant community on the Sinnigam soil is mainly bluebunch wheatgrass, rough fescue, green needlegrass, and plains muhly. If the range is excessively grazed, the proportion of these plants decreases and the proportion of Idaho fescue, needleandthread, prairie junegrass, and blue grama increases. If excessive grazing continues, plants such as Kentucky bluegrass, clubmoss, perennial weeds, and annuals may invade. The potential plant community

produces about 1,200 pounds of air-dry vegetation in years of above-normal precipitation and 800 pounds in years of below-normal precipitation.

These soils are suitable for seeding to adapted grasses and forbs if the range is in poor condition. Seedbed preparation and planting on the contour or across the slope, where practical, conserve moisture and help to control water erosion.

The Borky soil is suited to windbreaks, but the low available water capacity limits the growth of both trees and shrubs. Suitable trees for planting are Russian-olive, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, western sandcherry, and skunkbush sumac. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings.

The Sinnigam soil is poorly suited to windbreaks. It is limited mainly by the very low available water capacity.

The main limitations for homesite development on the soils in this unit are slow and moderately slow permeability, moderate and shallow depth to sandstone and shale, shrink-swell potential, content of rock fragments, and low soil strength. These soils are severely limited for septic tank absorption fields because of the slow and moderately slow permeability and the moderate and shallow depth to sandstone and shale. Cuts to level building sites can expose sandstone and shale. Shrinking and swelling and low soil strength can damage roadbeds and road surfaces. Adequate drainage and use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential. Removal of pebbles and cobbles in disturbed areas is needed for best results when landscaping, particularly in areas used for lawns.

This map unit is in capability subclass IVe, nonirrigated. The Borky soil is in Silty range site, 15- to 19-inch precipitation zone, and the Sinnigam soil is in Shallow range site, 15- to 19-inch precipitation zone.

26—Borky-Sinnigam very stony loams, 2 to 15 percent slopes. This map unit is on uplands in the central part of the county. Slopes commonly are 250 to 1,000 feet long. Elevation is 3,500 to 4,700 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 120 days.

This unit is about 45 percent Borky very stony loam and 25 percent Sinnigam very stony loam. The Borky soil is on plane side slopes, and the Sinnigam soil is on convex side slopes.

Included in this unit are small areas of shallow Amherst and Castner soils on ridges and moderately deep Absarokee soils on plane side slopes. Included areas make up about 30 percent of the total acreage.

The Borky soil is moderately deep and well drained. It formed in residuum derived dominantly from consolidated sandstone interbedded with shale. Typically, the surface layer is dark grayish brown very stony loam about 2 inches thick. The upper 3 inches of the subsoil is dark brown stony clay loam, the next 7 inches is dark brown very stony clay, and the lower 6 inches is brown very stony clay loam. The substratum is light grayish brown very stony clay loam about 18 inches thick. Light gray sandstone and shale are at a depth of about 36 inches. Depth to sandstone and shale ranges from 20 to 40 inches.

Permeability of the Borky soil is slow. Available water capacity is low. Effective rooting depth is 20 to 40 inches. The average annual wetting depth where this soil is under native vegetation is 20 to 30 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is slight.

The Sinnigam soil is shallow and well drained. It formed in residuum derived dominantly from fractured hard sandstone. Typically, the surface layer is dark brown very stony loam about 5 inches thick. The subsoil is brown very channery clay loam about 11 inches thick. Pale brown sandstone is at a depth of 16 inches. Depth to hard sandstone ranges from 10 to 20 inches.

Permeability of the Sinnigam soil is moderately slow. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. The average annual wetting depth where this soil is under native vegetation is 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is slight.

The soils in this unit are used as rangeland.

These soils are poorly suited to cultivated crops and to hay and pasture because of the large stones in the surface layer.

The potential plant community on the Borky soil is mainly bluebunch wheatgrass, western wheatgrass, rough fescue, and green needlegrass. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of Idaho fescue, needleandthread, western wheatgrass, and blue grama increases. If excessive grazing continues, plants such as Kentucky bluegrass, clubmoss, perennial weeds, and annuals may invade. The potential plant community produces about 2,000 pounds of air-dry vegetation in years of above-normal precipitation and 1,400 pounds in years of below-normal precipitation.

The potential plant community on the Sinnigam soil is mainly bluebunch wheatgrass, rough fescue, green needlegrass, and plains muhly. If the range is excessively grazed, the proportion of these plants decreases and the proportion of Idaho fescue, needleandthread, prairie junegrass, and blue grama increases. If excessive grazing continues, plants such as Kentucky bluegrass, clubmoss, perennial weeds, and

annuals may invade. The potential plant community produces about 1,200 pounds of air-dry vegetation in years of above-normal precipitation and 800 pounds in years of below-normal precipitation.

The surface layer of these soils is susceptible to water erosion if it is disturbed or if the range is overgrazed. These soils are not suited to mechanical treatment because of the large stones in the surface layer.

These soils are poorly suited to windbreaks. They are limited by stoniness.

The main limitations for homesite development on the soils in this unit are slow and moderately slow permeability, moderate and shallow depth to sandstone and shale, shrink-swell potential, content of rock fragments, and low soil strength. The soils are severely limited for septic tank absorption fields because of the slow and moderately slow permeability and moderate and shallow depth to sandstone and shale. Cuts to level building sites can expose sandstone and shale. Shrinking and swelling and low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential. Removal of pebbles and cobbles in disturbed areas is needed for best results when landscaping, particularly in areas used for lawns.

This map unit is in capability subclass VIs, nonirrigated. The Borky soil is in Silty range site, 15- to 19-inch precipitation zone, and the Sinnigam soil is in Shallow range site, 15- to 19-inch precipitation zone.

27—Brazon-Loken complex, 2 to 15 percent slopes. This map unit is on uplands, mountainsides, and fans in the central and southern parts of the county. Slopes commonly are 250 to 1,000 feet long. Elevation is 4,000 to 5,000 feet. The average annual precipitation is about 20 inches, the average annual air temperature is about 42 degrees F, and the average frost-free period is about 100 days.

This unit is about 40 percent Brazon very stony clay loam and 30 percent Loken stony clay loam. The Brazon soil is on convex side slopes, and the Loken soil is on plane and concave side slopes.

Included in this unit are small areas of moderately deep Regent and Winifred soils on side slopes below ridges and deep Savage soils on smooth slopes. Also included are small areas of shallow, very stony soils on ridges and small knolls. Included areas make up about 30 percent of the total acreage.

The Brazon soil is deep and well drained. It formed in alluvium and colluvium derived dominantly from semiconsolidated shale. Typically, the surface layer is very dark gray very stony clay loam about 8 inches thick. The upper 9 inches of the subsoil is light brownish gray very stony clay loam, and the lower 8 inches is light brownish gray very cobbly clay. The upper 15 inches of the substratum is light brownish gray very cobbly clay, and the lower 6 inches is light yellowish brown clay. Brownish yellow shale is at a depth of 46 inches. Depth to shale ranges from 40 to 60 inches.

Permeability of the Brazon soil is slow. Available water capacity is moderate. Effective rooting depth is 40 to 60 inches. The average annual wetting depth where this soil is under native vegetation is 40 to 60 inches. Runoff is medium to rapid, and the hazard of water erosion is high. The hazard of soil blowing is slight.

The Loken soil is deep and well drained. It formed in alluvium and colluvium derived dominantly from limestone and shale. Typically, the surface layer is very dark gray stony clay loam 6 inches thick. The upper 5 inches of the subsoil is brown silty clay loam and the lower 4 inches is grayish brown clay loam. The substratum to a depth of 60 inches or more is light gray gravelly clay loam.

Permeability of the Loken soil is slow. Available water capacity is moderate to high. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is 60 inches or more. Runoff is medium to rapid, and the hazard of water erosion is moderate to high. The hazard of soil blowing is slight.

The soils in this unit are used as rangeland.

These soils are poorly suited to cultivated crops and to hay and pasture because of the large stones in the surface layer.

The potential plant community on these soils is mainly rough fescue, bluebunch wheatgrass, green needlegrass, and western wheatgrass. If the range is excessively grazed, the proportion of these plants decreases and the proportion of Idaho fescue, plains reedgrass, blue grama, and Sandberg bluegrass increases. If excessive grazing continues, plants such as timothy, clubmoss, perennial weeds, and annuals may invade. The potential plant community produces about 2,300 pounds of air-dry vegetation in years of above-normal precipitation and 1,700 pounds in years of below-normal precipitation.

These soils are not suited to mechanical treatment because of the large stones in the surface layer.

These soils are poorly suited to windbreaks. They are limited by surface stoniness.

The main limitations for homesite development on the soils in this unit are slow permeability, shrink-swell potential, potential frost action, content of rock fragments, and low soil strength. If these soils are used for septic tank absorption fields, the slow permeability can be overcome by increasing the size of the absorption field and by excavating the tile line trenches to a suitable depth and backfilling them with gravel. Shrinking and swelling, frost action, and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is

properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential. Removal of pebbles and cobbles in disturbed areas is needed for best results when landscaping, particularly in areas used for lawns.

This map unit is in capability subclass VIs, nonirrigated, and in Clayey range site, 15- to 19-inch precipitation zone.

28—Brazon-Loken complex, 15 to 45 percent slopes. This map unit is on uplands, mountains, fans, and foot slopes in the central and southern parts of the county. Slopes commonly are more than 1,000 feet long. Elevation is 4,000 to 5,000 feet. The average annual precipitation is about 20 inches, the average annual air temperature is about 42 degrees F, and the average frost-free period is about 100 days.

This unit is about 45 percent Brazon very stony clay loam and 30 percent Loken stony clay loam. The Brazon soil is on the tops and sides of mountains, and the Loken soil is on fans and foot slopes.

Included in this unit are small areas of moderately deep Winifred soils on convex side slopes, moderately deep Regent soils on plane side slopes, deep Savage soils on fans, and deep, poorly drained Tomty soils on foot slopes. Also included are small areas of very stony soils on ridges along areas of limestone Rock outcrop. Included areas make up about 25 percent of the total acreage.

The Brazon soil is deep and well drained. It formed in alluvium and colluvium derived dominantly from semiconsolidated shale. Typically, the surface layer is very dark gray very stony clay loam about 8 inches thick. The upper 9 inches of the subsoil is light brownish gray very stony clay loam, and the lower 8 inches is light brownish gray very cobbly clay. The upper 15 inches of the substratum is light brownish gray very cobbly clay, and the lower 6 inches is light yellowish brown clay. Brownish yellow shale is at a depth of 46 inches. Depth to shale ranges from 40 to 60 inches.

Permeability of the Brazon soil is slow. Available water capacity is moderate. Effective rooting depth is 40 to 60 inches. The average annual wetting depth where this soil is under native vegetation is 40 to 60 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is slight.

The Loken soil is deep and well drained. It formed in alluvium and colluvium derived dominantly from limestone and shale. Typically, the surface layer is very dark gray stony clay loam about 6 inches thick. The upper 5 inches of the subsoil is brown silty clay loam, and the lower 4 inches is grayish brown clay loam. The substratum to a depth of 60 inches or more is light gray gravelly clay loam.

Permeability of the Loken soil is slow. Available water capacity is moderate to high. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is 60 inches or more. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is slight.

The soils in this unit are used as rangeland.

These soils are poorly suited to cultivated crops and to hay and pasture because of steepness of slope, rough topography, and large stones in the surface layer.

The potential plant community on these soils is mainly rough fescue, bluebunch wheatgrass, green needlegrass, and western wheatgrass. If the range is excessively grazed, the proportion of these plants decreases and the proportion of Idaho fescue, plains reedgrass, blue grama, and Sandberg bluegrass increases. If excessive grazing continues, plants such as timothy, clubmoss, perennial weeds, and annuals may invade. The potential plant community produces about 2,300 pounds of air-dry vegetation in years of above-normal precipitation and 1,700 pounds in years of below-normal precipitation.

Steepness of slope limits access of livestock and promotes overgrazing of the less sloping areas. The surface layer is susceptible to water erosion if it is disturbed or if the range is overgrazed. These soils are not suited to mechanical treatment because of slope and rough topography.

These soils are poorly suited to windbreaks. They are limited mainly by slope and by surface stoniness.

The soils in this unit are poorly suited to homesite development. The main limitations are slow permeability, slope, shrink-swell potential, potential frost action, content of rock fragments, and low soil strength. The soils are severely limited for septic tank absorption fields because of slope and slow permeability. Shrinking and swelling, frost action, and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential.

This map unit is in capability subclass VIe, nonirrigated, and in Clayey range site, 15- to 19-inch precipitation zone.

29—Bridger clay loam, 2 to 8 percent slopes. This deep, well drained soil is on fans and terraces in the south-central part of the county. It formed in alluvium derived dominantly from limestone. Slopes commonly are 250 to 1,000 feet long. Elevation is 4,700 to 6,000 feet. The average annual precipitation is about 22 inches, the average annual air temperature is about 40 degrees F, and the average frost-free period is about 70 days.

Included in this unit are small areas of soils that have a cobbly surface layer and soils that are underlain by bedrock at a depth of 40 to 60 inches.

Typically, the surface layer of this Bridger soil is very dark gray clay loam about 10 inches thick. The upper 10 inches of the subsoil is brown silty clay, and the lower 8 inches is very pale brown clay loam. The substratum to a depth of 60 inches or more is very pale brown very gravelly clay loam.

Permeability is moderate. Available water capacity is moderate to high. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

This soil is used mainly for hay and pasture and as rangeland. It is also used for nonirrigated crops such as wheat, barley, and oats.

This soil is suited to nonirrigated crops. It is limited mainly by the hazards of soil blowing and water erosion and the short growing season. Timeliness is of prime importance in all tillage, seeding, and harvesting operations. Minimum tillage, contour cultivation, grassed waterways, stubble-mulch tillage, and growing sod crops such as hay and pasture help to control soil blowing and water erosion.

The potential plant community on this soil is mainly rough fescue, bluebunch wheatgrass, Columbia needlegrass, and mountain brome. If the range is excessively grazed, the proportion of these plants decreases and the proportion of Idaho fescue, western wheatgrass, Letterman needlegrass, and spikeoat increases. If excessive grazing continues, plants such as timothy, Kentucky bluegrass, onespike danthonia, and perennial forbs may invade. The potential plant community produces about 3,600 pounds of air-dry vegetation in years of above-normal precipitation and 2,800 pounds in years of below-normal precipitation.

This soil is suitable for seeding to adapted grasses and forbs if the range is in poor condition. Seedbed preparation and planting on the contour or across the slope, where practical, help to control runoff and water erosion.

This soil is well suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian crabapple, green ash, Siberian elm, white willow, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and cotoneaster. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings.

The main limitations for homesite development on this soil are moderate permeability, shrink-swell potential, potential frost action, and low soil strength. Excavating septic tank absorption line trenches to a suitable depth and backfilling with porous material help to compensate for the moderate permeability. Shrinking and swelling, frost action, and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations.

This map unit is in capability subclass IVe, nonirrigated, and in Silty range site, 20- to 24-inch precipitation zone.

30—Bridger-Raynesford complex, 0 to 4 percent slopes. This map unit is on terraces in the south-central part of the county. Slopes commonly are 250 to 1,000 feet long. Elevation is 4,700 to 6,000 feet. The average annual precipitation is about 22 inches, the average annual air temperature is about 40 degrees F, and the average frost-free period is about 70 days.

This unit is about 30 percent Bridger cobbly clay loam and 30 percent Raynesford cobbly loam. The Bridger soil is on plane side slopes, and the Raynesford soil is on convex side slopes.

Included in this unit are small areas of deep Hanson soils on convex side slopes. Also included are small areas of Bridger and Raynesford clay loams. Included areas make up about 40 percent of the total acreage.

The Bridger soil is deep and well drained. It formed in alluvium derived dominantly from limestone. Typically, the surface layer is very dark gray cobbly clay loam about 10 inches thick. The upper 10 inches of the subsoil is brown silty clay, and the lower 8 inches is very pale brown clay loam. The substratum to a depth of 60 inches or more is very pale brown very gravelly clay loam.

Permeability of the Bridger soil is moderate. Available water capacity is moderate to high. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

The Raynesford soil is deep and well drained. It formed in alluvium derived dominantly from limestone. Typically, the surface layer is dark gray cobbly loam about 8 inches thick. The next layer is grayish brown clay loam about 4 inches thick. The upper 7 inches of the underlying material is light brownish gray clay loam, the next 4 inches is light brownish gray gravelly loam, the next 19 inches is pale yellow loam, and the lower part to a depth of 60 inches or more is light brownish gray very gravelly clay loam.

Permeability of the Raynesford soil is moderately slow. Available water capacity is moderate. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

The soils in this unit are used mainly for hay and pasture and as rangeland. They are also used for nonirrigated crops such as wheat, barley, and oats.

These soils are suited to nonirrigated crops. They are limited mainly by the hazard of soil blowing, the short growing season, and the moderate available water capacity of the Raynesford soil. Timeliness is of prime importance in all tillage, seeding, and harvesting operations. Soil blowing can be reduced by returning crop residue to the soil, practicing minimum tillage, and growing sod crops such as hay and pasture.

The potential plant community on the Bridger soil is mainly rough fescue, bluebunch wheatgrass, Columbia needlegrass, and mountain brome. If the range is excessively grazed, the proportion of these plants decreases and the proportion of Idaho fescue, western wheatgrass, Letterman needlegrass, and spikeoat increases. If excessive grazing continues, plants such as timothy, Kentucky bluegrass, onespike danthonia, and perennial forbs may invade. The potential plant community produces about 3,600 pounds of air-dry vegetation in years of above-normal precipitation and 2,800 pounds in years of below-normal precipitation.

The potential plant community on the Raynesford soil is mainly rough fescue, bluebunch wheatgrass, Columbia needlegrass, and mountain brome. If the range is excessively grazed, the proportion of these plants decreases and the proportion of Idaho fescue, western wheatgrass, Letterman needlegrass, and spikeoat increases. If excessive grazing continues, plants such as timothy, Kentucky bluegrass, onespike danthonia, and perennial forbs may invade. The potential plant community produces about 3,500 pounds of air-dry vegetation in years of above-normal precipitation and 2,600 pounds in years of below-normal precipitation.

These soils are suitable for seeding to adapted grasses and forbs if the range is in poor condition.

The Bridger soil is well suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian crabapple, green ash, Siberian elm, white willow, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and cotoneaster.

The Raynesford soil is suited to windbreaks, but the high concentration of lime at a depth of less than 15 inches and the limited moisture supply restrict the choice of trees and shrubs. Suitable trees for planting are Russian-olive, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, and skunkbush sumac.

Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings on these soils.

The main limitations for homesite development on the soils in this unit are moderate and moderately slow permeability, shrink-swell potential, potential frost action, and low soil strength. If these soils are used for septic tank absorption fields, the moderate and moderately slow permeability can be overcome by increasing the size of the absorption field. Shrinking and swelling, frost action, and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential.

This map unit is in capability subclass IVe, nonirrigated, and in silty range site, 20- to 24-inch precipitation zone.

31—Bridger Variant clay loam, 15 to 60 percent slopes. This deep, well drained soil is on mountainsides in the southern part of the county. It formed in colluvium and alluvium derived dominantly from shale and limestone. Slopes commonly are more than 1,000 feet long. Elevation is 5,000 to 6,500 feet. The average annual precipitation is about 22 inches, the average annual air temperature is about 40 degrees F, and the average frost-free period is about 70 days.

Included in this unit are small areas of deep Whitore soils and soils that are moderately deep over limestone and shale. Also included are small areas of Rock outcrop on ridgetops.

Typically, the surface of this Bridger Variant soil is covered by a mat of forest litter of undecomposed and decomposed needles, twigs, and cones about 3 inches thick. The surface layer is reddish brown clay loam about 9 inches thick. The upper 18 inches of the subsoil is reddish brown flaggy clay, and the lower part to a depth of 66 inches or more is reddish brown very flaggy clay.

Permeability is moderately slow. Available water capacity is moderate. Effective rooting depth is 66 inches or more. The average annual wetting depth where this soil is under native vegetation is 66 inches or more. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

This soil is used mainly as rangeland. It is also used as woodland.

This soil is poorly suited to cultivated crops and to hay and pasture because of steepness of slope and rough topography.

This soil is forested. It is poorly suited to livestock grazing. The potential native understory vegetation is dominated by white spirea, western meadowrue, grouse whortleberry, common snowberry, elk sedge, bearded wheatgrass, heartleaf arnica, russet buffaloberry, Woods rose, twinflower, whortleberry, fairybells, and Oregon-grape. The understory provides limited of forage for livestock.

This soil is suited to the production of Douglas-fir and lodgepole pine. The site index is about 42 for Douglas-fir. At the culmination of the mean annual increment (CMAI), the soil can produce about 55 cubic feet, or 180 board feet (Scribner rule), of Douglas-fir per acre per year. Potential production is estimated for an even-aged, fully stocked stand of trees.

Where slopes are 15 to 30 percent, the hazard of erosion is moderate, equipment limitations are moderate, seedling mortality is slight, plant competition is moderate, and the hazard of windthrow is moderate. Where slopes are 30 to 60 percent, the hazard of erosion and equipment limitations are severe and the other limitations are the same as where slopes are 15 to 30 percent.

The main limitations of the Bridger Variant soil for management of timber are moderately slow permeability, steepness of slope, clayey soil texture, and low soil strength. Where slopes are 30 to 60 percent, the kind of equipment that can be used is restricted and its operation is difficult. The soil has low strength when wet, which results in poor trafficability and in soil compaction if heavy equipment is used to yard logs. Operating equipment when the soil is dry or frozen overcomes this limitation. Reduction of plant competition helps to establish seedlings. Steepness of slope increases the hazard of erosion. Maintaining adequate plant cover on disturbed areas and using sediment filter strips of undisturbed vegetation along streams minimize soil erosion and water quality problems.

This soil is poorly suited to homesite development because of the steepness of slope.

This map unit is in capability subclass VIIe, nonirrigated. This map unit is in woodland suitability group 6c1 where slopes are 15 to 30 percent, group 6c3 where slopes are 30 to 45 percent, and group 6c5 where slopes are 45 to 60 percent.

32—Burnel silty clay loam, 0 to 2 percent slopes. This deep, well drained soil is on terraces and fans in the southwestern part of the county. It formed in alluvium. Slopes commonly are 250 to 1,000 feet long. Elevation is 4,100 to 4,800 feet. The average annual precipitation is about 20 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 100 days.

Included in this unit are small areas of deep Straw soils on narrow bottom lands that are subject to flooding early in spring.

Typically, the surface layer of this Burnel soil is very dark gray silty clay loam about 6 inches thick. The subsoil is dark gray, dark grayish brown, brown, and grayish brown silty clay about 44 inches thick. The substratum to a depth of 66 inches or more is light brownish gray silty clay loam that has strata of loam and fine sandy loam.

Permeability is slow. Available water capacity is high. Effective rooting depth is 66 inches or more. The average annual wetting depth where the soil is under native vegetation is 66 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is slight.

This soil is used for nonirrigated crops, mainly wheat, barley, oats, alfalfa, and grass for hay and pasture. It is also used as rangeland.

This soil is well suited to nonirrigated crops. It is limited mainly by the short growing season.

This soil is well suited to hay and pasture. It has few limitations. Rotation grazing helps to maintain the quality of forage.

The potential plant community on this soil is mainly rough fescue, bluebunch wheatgrass, western wheatgrass, and green needlegrass. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of Idaho fescue, western wheatgrass, plains reedgrass, and forbs increases. If excessive grazing continues, plants such as broom snakeweed, annuals, and perennial weeds may invade. The potential plant community produces about 2,700 pounds of air-dry vegetation in years of above-normal precipitation and 2,200 pounds in years of below-normal precipitation.

This soil is suitable for seeding to adapted grasses and forbs if the range is in poor condition.

This soil is well suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian crabapple, green ash, Siberian elm, white willow, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and cotoneaster. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings.

The main limitations for homesite development on this soil are slow permeability, shrink-swell potential, potential frost action, and low soil strength. If the soil is used for septic tank absorption fields, the slow permeability can be overcome by increasing the size of the absorption field. Shrinking and swelling, frost action, and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential.

This map unit is in capability subclass IIIc, nonirrigated, and in Clayey range site, 15- to 19-inch precipitation zone.

33—Burnel silty clay loam, 2 to 8 percent slopes. This deep, well drained soil is on fans and foot slopes in the southwestern part of the county. It formed in alluvium. Slopes commonly are 250 to 1,000 feet long. Elevation is 4,100 to 4,800 feet. The average annual precipitation is about 20 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 100 days.

Included in this unit are small areas of deep Straw soils on small fans near drainageways; these soils receive runoff from higher lying soils.

Typically, the surface layer of this Burnel soil is very dark gray silty clay loam about 6 inches thick. The subsoil is dark gray, dark grayish brown, brown, and grayish brown silty clay about 44 inches thick. The substratum to a depth of 66 inches or more is light brownish gray silty clay loam that has strata of loam and fine sandy loam.

Permeability is slow. Available water capacity is high. Effective rooting depth is 66 inches or more. The average annual wetting depth where this soil is under native vegetation is 66 inches or more. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is slight.

This soil is used for nonirrigated crops, mainly wheat, barley, oats, alfalfa, and grass for hay and pasture. It is also used as rangeland.

This soil is well suited to nonirrigated crops. It is limited mainly by the short growing season and the hazard of water erosion. Minimum tillage, contour cultivation, grassed waterways, stubble-mulch tillage, and growing sod crops such as hay and pasture help to control water erosion.

The potential plant community on this soil is mainly rough fescue, bluebunch wheatgrass, western wheatgrass, and green needlegrass. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of Idaho fescue, western wheatgrass, plains reedgrass, Sandberg bluegrass increases. If excessive grazing continues, plants such as broom snakeweed, annuals, Kentucky bluegrass, and perennial weeds may invade. The potential plant community produces about 2,700 pounds of air-dry vegetation in years of above-normal precipitation and 2,200 pounds in years of below-normal precipitation.

This soil is suitable for seeding to adapted grasses and forbs if the range is in poor condition. Seedbed preparation and planting on the contour or across the slope, where practical, help to control water erosion.

This soil is well suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian crabapple, green ash, Siberian elm, white willow, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and cotoneaster. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings.

The main limitations for homesite development on this soil are slow permeability, shrink-swell potential, potential frost action, and low soil strength. If the soil is used for septic tank absorption fields, the slow permeability can be overcome by increasing the size of the absorption field. Shrinking and swelling, frost action, and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential.

This map unit is in capability subclass IIIe, nonirrigated, and in Clayey range site, 15- to 19-inch precipitation zone.

34—Burnette silty clay loam, 2 to 8 percent slopes. This deep, well drained soil is on fans and terraces in the southwestern part of the county. It formed in alluvium derived from mixed rock sources. Slopes commonly are 250 to 1,000 feet long. Elevation is 4,500 to 6,000 feet. The average annual precipitation is about 22 inches, the average annual air temperature is about 40 degrees F, and the average frost-free period is about 70 days.

Included in this unit are small areas of deep Hoosan soils on terraces near drainageways. Also included are small areas of Burnette soils that have slopes of more than 8 percent.

Typically, the surface layer of this Burnette soil is very dark grayish brown silty clay loam 19 inches thick. The upper 11 inches of the subsoil is dark brown silty clay, the next 12 inches is brown silty clay, and the lower part to a depth of 60 inches or more is yellowish brown silty clay.

Permeability is slow. Available water capacity is high. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is slight.

This soil is used for nonirrigated crops, mainly wheat, barley, oats, alfalfa, and grass for hay and pasture. It is also used as rangeland.

This soil is suited to nonirrigated crops. It is limited mainly by the short growing season and the hazard of water erosion. Minimum tillage, contour cultivation, grassed waterways, stubble-mulch tillage, and growing sod crops such as hay and pasture help to control water erosion.

The potential plant community on this soil is mainly rough fescue, bearded wheatgrass, mountain brome, and Columbia needlegrass. If the range is excessively grazed, the proportion of these plants decreases and the proportion of Idaho fescue, western wheatgrass, shrubby cinquefoil, and lupine increases. If excessive grazing continues, plants such as timothy, Kentucky bluegrass, perennial forbs, and annuals may invade. The potential plant community produces about 3,500 pounds of air-dry vegetation in years of above-normal precipitation and 2,700 pounds in years of below-normal precipitation.

This soil is suitable for seeding to adapted grasses and forbs if the range is in poor condition. Seedbed preparation and planting on the contour or across the slope, where practical, help to control water erosion.

This soil is well suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian crabapple, green ash, Siberian elm, white willow, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and cotoneaster. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings.

The main limitations for homesite development on this soil are moderately slow permeability, shrink-well potential, potential frost action, and low soil strength. If the soil is used for septic tank absorption fields, the moderately slow permeability can be overcome by increasing the size of the absorption field. Shrinking and swelling, frost action, and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential.

This map unit is in capability subclass IIIe, nonirrigated, and in Clayey range site, 20- to 24-inch precipitation zone.

35—Burnette-Burnette Variant silty clay loams, 2 to 8 percent slopes. This map unit is on uplands in the south-central part of the county. Slopes commonly are 250 to 1,000 feet long. Elevation is 4,500 to 6,000 feet. The average annual precipitation is about 22 inches, the average annual air temperature is about 40 degrees F, and the average frost-free period is about 70 days.

This unit is about 60 percent Burnette silty clay loam and 35 percent Burnette Variant silty clay loam. The Burnette soil is on foot slopes and fans, and the Burnette Variant soil is in convex areas.

Included in this unit is about 5 percent moderately deep Kildor soils on knolls.

The Burnette soil is deep and well drained. It formed in alluvium derived from mixed rock sources. Typically, the surface layer is very dark grayish brown silty clay loam 19 inches thick. The upper 11 inches of the subsoil is dark brown silty clay, the next 12 inches is brown silty clay, and the lower part to a depth of 60 inches or more is yellowish brown silty clay.

Permeability of the Burnette soil is slow. Available water capacity is high. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is slight.

The Burnette Variant soil is moderately deep and well drained. It formed in residuum and alluvium derived dominantly from semiconsolidated shale. Typically, the surface layer is dark gray and very dark gray silty clay loam about 11 inches thick. The subsoil is very dark gray and reddish brown clay about 17 inches thick. The substratum is gray clay about 8 inches thick. Dark gray and light yellowish brown semiconsolidated shale is at a depth of 36 inches. Depth to shale ranges from 20 to 40 inches.

Permeability of the Burnette Variant soil is slow. Available water capacity is moderate. Effective rooting depth is 20 to 40 inches. The average annual wetting depth where this soil is under native vegetation is 20 to 40 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is slight.

The soils in this unit are used mainly for hay and pasture. They are also used for nonirrigated crops, such as wheat, barley, and oats, and as rangeland.

These soils are suited to nonirrigated crops. They are limited mainly by the hazard of water erosion and the short growing season. Timeliness is of prime importance in all tillage, seeding, and harvesting operations. Minimum tillage, contour cultivation, grassed waterways, stubble-mulch tillage, and grwing sod crops such as hay and pasture help to control water erosion.

The potential plant community on these soils is mainly rough fescue, Columbia needlegrass, bearded wheatgrass, and mountain brome. If the range is excessively grazed, the proportion of these plants decreases and the proportion of Idaho fescue, western wheatgrass, big sagebrush, and lupine increases. If excessive grazing continues, plants such as timothy, Kentucky bluegrass, perennial forbs, and annuals may invade. The potential plant community produces about 3,500 pounds of air-dry vegetation in years of above-normal precipitation and 2,700 pounds in years of below-normal precipitation.

These soils are suitable for seeding to adapted grasses and forbs if the range is in poor condition. Seedbed preparation and planting on the contour or across the slope, where practical, help to control water erosion.

The Burnette soil is well suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian crabapple, green ash, Siberian elm, white willow, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and cotoneaster.

The Burnette Variant soil is suited to windbreaks, but the moderate available water capacity of the soil limits the growth of both trees and shrubs. Suitable trees for planting are Russian-olive, Siberian crabapple, green ash, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and cotoneaster.

Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings on these soils.

The main limitations for homesite development on the soils in this unit are slow permeability, shrink-swell

potential, potential frost action, low soil strength, and moderate depth to shale in the Burnette Variant soil. If the Burnette soil is used for septic tank absorption fields, the slow permeability can be overcome by increasing the size of the absorption field. The Burnette Variant soil is severely limited for septic tank absorption fields because of the slow permeability and moderate depth to shale. Shrinking and swelling, frost action, and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential.

This map unit is in capability subclass IVe, nonirrigated, and in Clayey range site, 20- to 24-inch precipitation zone.

36—Burnette-Burnette Variant silty clay loams, 8 to 15 percent slopes. This map unit is on uplands in the south-central part of the county. Slopes commonly are 250 to 1,000 feet long. Elevation is 4,500 to 6,000 feet. The average annual precipitation is about 22 inches, the average annual air temperature is about 40 degrees F, and the average frost-free period is about 70 days.

This unit is about 50 percent Burnette silty clay loam and 40 percent Burnette Variant silty clay loam. The Burnette soil is on foot slopes and fans, and the Burnette Variant soil is in convex areas above the Burnette soil.

Included in this unit is about 10 percent moderately deep Kildor soils on knolls.

The Burnette soil is deep and well drained. It formed in alluvium derived from mixed rock sources. Typically, the surface layer is very dark grayish brown silty clay loam 19 inches thick. The upper 11 inches of the subsoil is dark brown silty clay, the next 12 inches is brown silty clay, and the lower part to a depth of 60 inches or more is yellowish brown silty clay.

Permeability of the Burnette soil is slow. Available water capacity is high. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is 60 inches or more. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is slight.

The Burnette Variant soil is moderately deep and well drained. It formed in residuum and alluvium derived dominantly from semiconsolidated shale. Typically, the surface layer is dark gray and very dark gray silty clay loam about 11 inches thick. The subsoil is very dark gray and reddish brown clay about 17 inches thick. The substratum is gray clay about 8 inches thick. Dark gray and light yellowish brown semiconsolidated shale is at a depth of about 36 inches. Depth to shale ranges from 20 to 40 inches.

Permeability of the Burnette Variant soil is slow. Available water capacity is moderate. Effective rooting depth is 20 to 40 inches. The average annual wetting depth where this soil is under native vegetation is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is slight.

The soils in this unit are used mainly for hay and pasture. They are also used for nonirrigated crops, such as wheat, barley, and oats, and as rangeland.

These soils are suited to nonirrigated crops. They are limited mainly by the hazard of water erosion and the short growing season. Timeliness is of prime importance in all tillage, seeding, and harvesting operations. Minimum tillage, contour cultivation, grassed waterways, stubble-mulch tillage, and growing sod crops such as hay and pasture help to control water erosion.

The potential plant community on these soils is mainly rough fescue, Columbia needlegrass, bearded wheatgrass, and mountain brome. If the range is excessively grazed, the proportion of these plants decreases and the proportion of Idaho fescue, western wheatgrass, big sagebrush, and lupine increases. If excessive grazing continues, plants such as Kentucky bluegrass, timothy, perennial forbs, and annuals may invade. The potential plant community produces about 3,500 pounds of air-dry vegetation in years of above-normal precipitation and 2,700 pounds in years of below-normal precipitation.

These soils are suitable for seeding to adapted grasses and forbs if the range is in poor condition. Seedbed preparation and planting on the contour or across the slope, where practical, help to control water erosion.

The Burnette soil is well suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian crabapple, green ash, Siberian elm, white willow, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and cotoneaster.

The Burnette Variant soil is suited to windbreaks, but the moderate available water capacity of the soil limits the growth of both trees and shrubs. Suitable trees for planting are Russian-olive, Siberian crabapple, green ash, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and cotoneaster.

Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings on these soils. Planting on the contour helps to conserve moisture.

The main limitations for homesite development on the soils in this unit are slow permeability, shrink-swell potential, potential frost action, low soil strength, and moderate depth to shale in the Burnette Variant soil. If the Burnette soil is used for septic tank absorption fields, the slow permeability can be overcome by increasing the

size of the absorption field. The Burnette Variant soil is severely limited for septic tank absorption fields because of the slow permeability and moderate depth to shale. Cuts to level building sites can expose shale in the Burnette Variant soil. Shrinking and swelling, frost action, and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential.

This map unit is in capability subclass IVe, nonirrigated, and in Clayey range site, 20- to 24-inch precipitation zone.

37—Cabba-Doney-Wayden complex, 4 to 8 percent slopes. This map unit is on uplands in the central and western parts of the county. Slopes commonly are 250 to 1,000 feet long. Elevation is 3,400 to 4,200 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 120 days.

This unit is about 30 percent Cabba loam, 30 percent Doney loam, and 30 percent Wayden silty clay loam. The Cabba and Wayden soils are on the tops of ridges and knolls, and the Doney soil is on the sides of ridges and knolls.

Included in this unit is about 10 percent moderately deep Winifred soils on side slopes.

The Cabba soil is shallow and well drained. It formed in residuum derived dominantly from weakly consolidated, sandy and silty sedimentary beds. Typically, the surface layer is grayish brown loam about 2 inches thick. The next layer is pale brown loam about 6 inches thick. The substratum is yellow channery loam about 7 inches thick. Very pale brown, weakly consolidated, sandy and silty sedimentary beds are at a depth of about 15 inches. Depth to sedimentary beds ranges from 10 to 20 inches.

Permeability of the Cabba soil is moderate. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. The average annual wetting depth where this soil is under native vegetation is 10 to 20 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high.

The Doney soil is moderately deep and well drained. It formed in residuum derived dominantly from weakly consolidated, sandy and silty sedimentary beds. Typically, the surface layer is light brownish gray loam about 4 inches thick. The subsoil is very pale brown loam about 10 inches thick. The substratum is very pale brown loam about 11 inches thick. Pale yellow, weakly consolidated, sandy and silty sedimentary beds are at a depth of about 25 inches. Depth to sedimentary beds ranges from 20 to 40 inches.

Permeability of the Doney soil is moderate. Available water capacity is low. Effective rooting depth is 20 to 40 inches. The average annual wetting depth where this soil is under native vegetation is about 20 to 30 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high.

The Wayden soil is shallow and well drained. It formed in residuum derived dominantly from semiconsolidated shale. Typically, the surface layer is light brownish gray silty clay loam about 6 inches thick. The underlying material is light brownish gray silty clay loam and silty clay 10 inches thick. Light gray semiconsolidated shale is at a depth of about 16 inches. Depth to shale ranges from 10 to 20 inches.

Permeability of the Wayden soil is slow. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. The average annual wetting depth where this soil is under native vegetation is 10 to 20 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high.

The soils in this unit are used mainly as rangeland. They are also used for hay and pasture.

These soils are poorly suited to nonirrigated crops because of the very low and low available water capacity.

These soils are suited to hay and pasture. They are limited mainly by the very low and low available water capacity and the hazards of soil blowing and water erosion. Seedbed preparation and planting on the contour or across the slope, where practical, conserve moisture and help to control water erosion. Use of nitrogen and phosphorus fertilizer promotes good growth of forage plants. Rotation grazing helps to maintain the quality of forage.

The potential plant community on the Cabba soil is mainly bluebunch wheatgrass, western wheatgrass, needleandthread, and prairie junegrass. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of needleandthread, blue grama, fringed sagewort, and threadleaf sedge increases. If excessive grazing continues, plants such as Kentucky bluegrass, broom snakeweed, clubmoss, and perennial weeds may invade. The potential plant community produces about 900 pounds of air-dry vegetation in years of above-normal precipitation and 400 pounds in years of below-normal precipitation.

The potential plant community on the Doney soil is mainly bluebunch wheatgrass, green needlegrass, western wheatgrass, and little bluestem. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of western wheatgrass, needleandthread, blue grama, and Sandberg bluegrass increases. If excessive grazing continues, plants such as Kentucky bluegrass, timothy, perennial weeds, and red threeawn may invade. The potential plant community produces about 1,500 pounds of air-dry

vegetation in years of above-normal precipitation and 900 pounds in years of below-normal precipitation.

The potential plant community on the Wayden soil is mainly western wheatgrass, bluebunch wheatgrass, green needlegrass, and plains muhly. If the range is excessively grazed, the proportion of these plants decreases and the proportion of blue grama, prairie junegrass, needleandthread, and fringed sagewort increases. If excessive grazing continues, plants such as Kentucky bluegrass, clubmoss, perennial weeds, and annuals may invade. The potential plant community produces about 900 pounds of air-dry vegetation in years of above-normal precipitation and 400 pounds in years of below-normal precipitation.

These soils are suitable for seeding to adapted grasses and forbs if the range is in poor condition. Seedbed preparation and planting on the contour or across the slope, where practical, conserve moisture and help to control water erosion.

The Cabba and Wayden soils are poorly suited to windbreaks. They are limited mainly by the very low available water capacity.

The Doney soil is suited to windbreaks, but the low available water capacity of the soil limits the growth of both trees and shrubs. Suitable trees for planting are Russian-olive, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, western sandcherry, and skunkbush sumac. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings.

The main limitations for homesite development on the Cabba and Doney soils are shallow and moderate depth to sedimentary beds, potential frost action, and low soil strength. If these soils are used for septic tank absorption fields, the slow permeability of the underlying sedimentary beds can be overcome by increasing the size of the absorption field or by excavating the trench to a suitable depth. The field or trench should be backfilled with gravel. Frost action and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations.

The main limitations for homesite development on the Wayden soil are slow permeability, shallow depth to shale, shrink-swell potential, potential frost action, and low soil strength. This soil is severely limited for septic tank absorption fields because of the slow permeability and shallow depth to shale. Cuts to level building sites can expose shale. Shrinking and swelling, frost action, and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential.

This map unit is in capability subclass VIe, nonirrigated. The Cabba and Wayden soils are in Shallow range site, 15- to 19-inch precipitation zone, and the Doney soil is in Silty range site, 15- to 19-inch precipitation zone.

38—Cabba-Wayden-Rock outcrop complex, 45 to 60 percent slopes. This map unit is on uplands in the central and western parts of the county. Slopes commonly are 250 to 1,000 feet long. Elevation is 3,400 to 4,200 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 120 days.

This unit is about 30 percent Cabba loam, 25 percent Wayden silty clay loam, and 20 percent Rock outcrop. The Cabba and Wayden soils are on convex and plane side slopes, and Rock outcrop is in the form of ledges.

Included in this unit are areas of moderately deep Doney and Winifred soils and small areas of deep Linwell and Shambo soils that have slopes of 8 to 15 percent. Included areas make up about 25 percent of the total acreage.

The Cabba soil is shallow and well drained. It formed in residuum derived dominantly from weakly consolidated, sandy and silty sedimentary beds. Typically, the surface layer is grayish brown loam about 2 inches thick. The next layer is pale brown loam about 6 inches thick. The underlying material is yellow channery loam about 7 inches thick. Very pale brown, weakly consolidated, sandy and silty sedimentary beds are at a depth of about 15 inches. Depth to sedimentary beds ranges from 10 to 20 inches.

Permeability of the Cabba soil is moderate. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. The average annual wetting depth where this soil is under native vegetation is 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is high.

The Wayden soil is shallow and well drained. It formed in residuum derived dominantly from semiconsolidated shale. Typically, the surface layer is light brownish gray silty clay loam about 6 inches thick. The underlying material is light brownish gray silty clay loam and silty clay 10 inches thick. Light gray semiconsolidated shale is at a depth of about 16 inches. Depth to shale ranges from 10 to 20 inches.

Permeability of the Wayden soil is slow. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. The average annual wetting depth where this soil is under native vegetation is 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is high.

Rock outcrop consists of exposures of sandstone and shale. The sandstone is ledges, and the shale is on very steep side slopes.

The soils in this unit are used as rangeland.

These soils are poorly suited to cultivated crops and to hay and pasture because of steepness of slope and rough topography.

The potential plant community on the Cabba soil is mainly bluebunch wheatgrass, western wheatgrass, needleandthread, and prairie junegrass. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of needleandthread, blue grama, fringed sagewort, and threadleaf sedge increases. If excessive grazing continues, plants such as Kentucky bluegrass, broom snakeweed, clubmoss, and perennial weeds may invade. The potential plant community produces about 900 pounds of air-dry vegetation in years of above-normal precipitation and 400 pounds in years of below-normal precipitation.

The potential plant community on the Wayden soil is mainly bluebunch wheatgrass, western wheatgrass, green needlegrass, and plains muhly. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, blue grama, fringed sagewort, and prairie junegrass increases. If excessive grazing continues, plants such as Kentucky bluegrass, broom snakeweed, clubmoss, and perennial weeds may invade. The potential plant community produces about 900 pounds of air-dry vegetation in years of above-normal precipitation and 400 pounds in years of below-normal precipitation.

Steep slopes and areas of Rock outcrop limit access of livestock. Less sloping areas are subject to overgrazing. The surface layer is susceptible to water erosion and soil blowing if it is disturbed or if the range is overgrazed. These soils are not suited to mechanical treatment because of slope and rough topography.

These soils are poorly suited to windbreaks. They are limited mainly by slope.

These soils are poorly suited to homesite development because of the steepness of slope, shallow depth to sedimentary beds in the Cabba soil, shallow depth to shale in the Wayden soil, and the areas of Rock outcrop.

This map unit is in capability subclass VIIe, nonirrigated, and in Shallow range site, 15- to 19-inch precipitation zone.

39—Cabston-Delplain channery clay loams, 25 to 60 percent slopes. This map unit is on uplands in the east-central part of the county. Slopes commonly are less than 250 feet long. Elevation is 3,000 to 3,800 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 44 degrees F, and the average frost-free period is about 130 days.

This unit is about 50 percent Cabston channery clay loam and 35 percent Delplain channery clay loam. The Cabston soil is on foot slopes and fans, and the Delplain soil is on hilltops.

Included in this unit are small areas of shallow Dilts soils and moderately deep Tanna soils on uplands and deep Ethridge soils on foot slopes. Also included are small areas of Rock outcrop in the form of ledges. Included areas make up about 15 percent of the total acreage.

The Cabston soil is deep and well drained. It formed in alluvium and colluvium derived dominantly from shale and sandstone. Typically, the surface layer is grayish brown channery clay loam about 4 inches thick. The subsoil is grayish brown and light brownish gray very channery clay loam about 17 inches thick. The substratum to a depth of 66 inches or more is light brownish gray very channery clay loam.

Permeability of the Cabston soil is moderately slow. Available water capacity is low to moderate. Effective rooting depth is 66 inches or more. The average annual wetting depth where this soil is under native vegetation is about 22 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

The Delplain soil is shallow and well drained. It formed in residuum derived dominantly from hard shale and sandstone. Typically, the surface layer is grayish brown channery clay loam about 4 inches thick. The underlying material is grayish brown extremely channery clay loam about 14 inches thick. Light gray shale and sandstone are at a depth of 18 inches. Depth to shale and sandstone ranges from 10 to 20 inches.

Permeability of the Delplain soil is moderately slow. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. The average annual wetting depth where this soil is under native vegetation is 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

The soils in this unit are used as rangeland.

These soils are poorly suited to cultivated crops and to hay and pasture because of steepness of slope and rough topography.

The potential plant community on the Cabston soil is mainly western wheatgrass, green needlegrass, bluebunch wheatgrass, and thickspike wheatgrass. If the range is excessively grazed, the proportion of these plants decreases and the proportion of plains reedgrass, blue grama, Sandberg bluegrass, and fringed sagewort increases. If excessive grazing continues, plants such as perennial weeds, broom snakeweed, annuals, and clubmoss may invade. The potential plant community produces about 1,400 pounds of air-dry vegetation in years of above-normal precipitation and 800 pounds in years of below-normal precipitation.

The potential plant community on the Delplain soil is mainly western wheatgrass, bluebunch wheatgrass, prairie sandreed, and green needlegrass. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, blue grama, prairie junegrass, and fringed sagewort increases. If excessive grazing continues, plants such as red threeawn, pricklypear, broom snakeweed, and annuals may invade. The potential plant community produces

about 900 pounds of air-dry vegetation in years of above-normal precipitation and 300 pounds in years of below-normal precipitation.

These soils are not suited to mechanical treatment because of slope and rough topography. Steep slopes and areas of Rock outcrop limit access of livestock, so less sloping areas are subject to overgrazing. The surface layer is susceptible to water erosion and soil blowing if it is disturbed or if the range is overgrazed.

These soils are poorly suited to windbreaks. They are limited mainly by slope.

These soils are poorly suited to homesite development because of the steepness of slope and the shallow depth to bedrock in the Delplain soil.

This map unit is in capability subclass VIIe, nonirrigated. The Cabston soil is in Clayey range site, 10- to 14-inch precipitation zone, and the Delplain soil is in Shallow range site, 10- to 14-inch precipitation zone.

40—Cabston-Delplain-Crago complex, 15 to 45 percent slopes. This map unit is on terrace edges, ridges, and foot slopes in the east-central part of the county. Slopes commonly are 250 to 1,000 feet long. Elevation is 3,000 to 3,800 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 44 degrees F, and the average frost-free period is about 130 days.

This unit is about 25 percent Cabston channery clay loam, 25 percent Delplain channery clay loam, and 20 percent Crago very gravelly loam. The Cabston soil is on foot slopes, the Delplain soil is on ridges, and the Crago soil is on terrace edges.

Included in this unit are small areas of moderately deep Abor and Thebo soils and shallow Neldore soils. Included areas make up about 30 percent of the total acreage.

The Cabston soil is deep and well drained. It formed in alluvium and colluvium derived dominantly from shale and sandstone. Typically, the surface layer is grayish brown channery clay loam about 4 inches thick. The subsoil is grayish brown and light brownish gray very channery clay loam about 17 inches thick. The substratum to a depth of 66 inches or more is light brownish gray very channery clay loam.

Permeability of the Cabston soil is moderately slow. Available water capacity is low to moderate. Effective rooting depth is 66 inches or more. The average annual wetting depth where this soil is under native vegetation is about 22 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

The Delplain soil is shallow and well drained. It formed in residuum derived dominantly from hard shale and sandstone. Typically, the surface layer is grayish brown channery clay loam about 4 inches thick. The underlying material is grayish brown extremely channery clay loam about 14 inches thick. Light gray shale and sandstone are at a depth of about 18 inches. Depth to shale and sandstone ranges from 10 to 20 inches.

Permeability of the Delplain soil is moderately slow. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. The average annual wetting depth where this soil is under native vegetation is 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

The Crago soil is deep and well drained. It formed in alluvium derived dominantly from limestone. Typically, the surface layer is grayish brown very gravelly loam about 3 inches thick. The subsurface layer is pale brown extremely gravelly loam about 4 inches thick. The upper 11 inches of the underlying material is very pale brown extremely gravelly loam, and the lower part to a depth of 60 inches or more is pale brown extremely gravelly sandy loam.

Permeability of the Crago soil is moderate to a depth of 18 inches and moderately rapid below this depth. Available water capacity is moderate to low. Effective rooting depth is 60 inches. The average annual wetting depth where this soil is under native vegetation is about 24 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is high.

The soils in this unit are used as rangeland.

These soils are poorly suited to cultivated crops and to hay and pasture because of steepness of slope and rough topography.

The potential plant community on the Cabston soil is mainly western wheatgrass, green needlegrass, bluebunch wheatgrass, and thickspike wheatgrass. If the range is excessively grazed, the proportion of these plants decreases and the proportion of plains reedgrass, blue grama, Sandberg bluegrass, and fringed sagewort increases. If excessive grazing continues, plants such as perennial weeds, broom snakeweed, annuals, and clubmoss may invade. The potential plant community produces about 1,400 pounds of air-dry vegetation in years of above-normal precipitation and 800 pounds in years of below-normal precipitation.

The potential plant community on the Delplain soil is mainly western wheatgrass, bluebunch wheatgrass, prairie sandreed, and green needlegrass. If the range is excessively grazed, the proportion of these plants decreases and the proportion of blue grama, prairie junegrass, fringed sagewort, and creeping juniper increases. If excessive grazing continues, plants such as red threeawn, pricklypear, broom snakeweed, and annuals may invade. The potential plant community produces about 900 pounds of air-dry vegetation in years of above-normal precipitation and 300 pounds in years of below-normal precipitation.

The potential plant community on the Crago soil is mainly bluebunch wheatgrass, western wheatgrass, green needlegrass, and needleandthread. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of needleandthread,

blue grama, prairie junegrass, and fringed sagewort increases. If excessive grazing continues, plants such as perennial weeds, broom snakeweed, clubmoss, and annuals may invade. The potential plant community produces about 800 pounds of air-dry vegetation in years of above-normal precipitation and 400 pounds in years of below-normal precipitation.

These soils are not suited to mechanical treatment because of slope and rough topography. Steepness of slope limits access of livestock and promotes overgrazing of the less sloping areas. The surface layer is susceptible to water erosion and soil blowing if it is disturbed or if the range is overgrazed.

These soils are poorly suited to windbreaks. They are limited mainly by slope.

The main limitations for homesite development on the Cabston soil are moderately slow permeability, slope, shrink-swell potential, and low soil strength. Slope is a concern in installing septic tank absorption fields. Absorption lines should be installed on the contour. Excavating septic tank absorption line trench to a suitable depth and backfilling with porous material help to compensate for the moderately slow permeability. Shrinking and swelling and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential.

The Delplain soil in this unit is poorly suited to homesite development because of the steepness of slope and the shallow depth to bedrock.

The main limitations for homesite development on the Crago soil are slope and content of rock fragments. Slope is a concern in installing septic tank absorption fields. Absorption lines should be installed on the contour. Access roads should be designed to help to control surface runoff and stabilize cut slopes.

This map unit is in capability subclass VIIe, nonirrigated. The Cabston soil is in Clayey range site, 10- to 14-inch precipitation zone, the Delplain soil is in Shallow range site, 10- to 14-inch precipitation zone, and the Crago soil is in Limy range site, 10- to 14-inch precipitation zone.

41—Castle clay, 2 to 8 percent slopes. This moderately deep, well drained soil is on uplands in the south-central part of the county. It formed in residuum derived from semiconsolidated shale. Slopes commonly are 250 to 1,000 feet long. Elevation is 4,500 to 5,600 feet. The average annual precipitation is about 22 inches, the average annual air temperature is about 40 degrees F, and the average frost-free period is about 70 days.

Included in this unit are small areas of shallow, clayey soils on knolls and deep Pekay soils on fans.

Typically, the surface layer of this Castle soil is very dark gray clay about 3 inches thick. The upper 11 inches of the subsoil is very dark gray and dark gray clay, and the lower 4 inches is grayish brown clay. The substratum is gray clay about 14 inches thick. Gray semiconsolidated shale is at a depth of 32 inches. Depth to shale ranges from 20 to 40 inches.

Permeability is very slow. Available water capacity is low to moderate. Effective rooting depth is 20 to 40 inches. The average annual wetting depth where this soil is under native vegetation is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is moderate. The hazard of soil blowing is high.

This soil is used mainly as rangeland. It is also used for hay and pasture and for nonirrigated crops such as wheat, barley, and oats.

This soil is suited to nonirrigated crops. It is limited mainly by the short growing season and the hazards of soil blowing and water erosion. Timeliness is of prime importance in all tillage, seeding, and harvesting operations. Minimum tillage, contour cultivation, grassed waterways, stubble-mulch tillage, and growing sod crops such as hay and pasture help to control soil blowing and water erosion.

The potential plant community on this soil is mainly rough fescue, Columbia needlegrass, bearded wheatgrass, and mountain brome. If the range is excessively grazed, the proportion of these plants decreases and the proportion of Idaho fescue, western wheatgrass, big sagebrush, and lupine increases. If excessive grazing continues, plants such as timothy, Kentucky bluegrass, perennial forbs, and annuals may invade. The potential plant community produces about 2,800 pounds of air-dry vegetation in years of above-normal precipitation and 2,200 pounds in years of below-normal precipitation.

This soil is suitable for seeding to adapted grasses and forbs if the range is in poor condition. Seedbed preparation and planting on the contour or across the slope, where practical, conserve moisture and help to control water erosion. The surface layer is susceptible to water erosion and soil blowing if it is disturbed or if the range is overgrazed. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and to protect the soil from erosion.

This soil is suited to windbreaks, but the low to moderate available water capacity of the soil limits the growth of both trees and shrubs. Suitable trees for planting are Russian-olive, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, western sandcherry, and skunkbush sumac. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings.

The main limitations for homesite development on this soil are very slow permeability, moderate depth to shale,

shrink-swell potential, and low soil strength. This soil is severely limited for septic tank absorption fields because of the very slow permeability and moderate depth to shale. Cuts to level building sites can expose shale. Shrinking and swelling and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential.

This map unit is in capability subclass IVe, nonirrigated, and in Clayey range site, 20- to 24-inch precipitation zone.

42—Castle clay, 8 to 15 percent slopes. This moderately deep, well drained soil is on uplands in the south-central part of the county. It formed in residuum derived from semiconsolidated shale. Slopes commonly are less than 250 feet long. Elevation is 4,500 to 5,600 feet. The average annual precipitation is about 22 inches, the average annual air temperature is about 40 degrees F, and the average frost-free period is about 70 days.

Included in this unit are small areas of shallow, clayey soils on knolls and deep Pekay soils, on fans and foot slopes, that have slopes of less than 8 percent.

Typically, the surface layer of this Castle soil is very dark gray clay about 3 inches thick. The upper 11 inches of the subsoil is very dark gray and dark gray clay, and the lower 4 inches is grayish brown clay. The substratum is gray clay about 14 inches thick. Gray semiconsolidated shale is at a depth of 32 inches. Depth to shale ranges from 20 to 40 inches.

Permeability is very slow. Available water capacity is low to moderate. Effective rooting depth is 20 to 40 inches. The average annual wetting depth where this soil is under native vegetation is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is high.

This soil is used mainly as rangeland. It is also used for hay and pasture and for nonirrigated crops such as wheat, barley, and oats.

This soil is suited to nonirrigated crops. It is limited mainly by the short growing season and the hazards of soil blowing and water erosion. Timeliness is of prime importance in all tillage, seeding, and harvesting operations. Minimum tillage, contour cultivation, grassed waterways, stubble-mulch tillage, and growing sod crops such as hay and pasture help to control soil blowing and water erosion.

The potential plant community on this soil is mainly rough fescue, Columbia needlegrass, bearded wheatgrass, and mountain brome. If the range is excessively grazed, the proportion of these plants decreases and the proportion of Idaho fescue, western wheatgrass, big sagebrush, and lupine increases. If excessive grazing continues, plants such as Kentucky bluegrass, timothy, perennial forbs, and annuals may invade. The potential plant community produces about 2,800 pounds of air-dry vegetation in years of above-normal precipitation and 2,200 pounds in years of below-normal precipitation.

This soil is suitable for seeding to adapted grasses and forbs if the range is in poor condition. Seedbed preparation and planting on the contour or across the slope, where practical, conserve moisture and help to control water erosion. The surface layer is susceptible to water erosion and soil blowing if it is disturbed or if the range is overgrazed. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and to protect the soil from erosion.

This soil is suited to windbreaks, but the low to moderate available water capacity of the soil limits the growth of both trees and shrubs. Suitable trees for planting are Russian-olive, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, western sandcherry, and skunkbush sumac. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings. Planting on the contour helps to conserve moisture.

The main limitations for homesite development on this soil are very slow permeability, moderate depth to shale, shrink-swell potential, and low soil strength. The soil is severely limited for septic tank absorption fields because of the very slow permeability and moderate depth to shale. Cuts to level building sites can expose shale. Shrinking and swelling and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential.

This map unit is in capability subclass IVe, nonirrigated, and in Clayey range site, 20- to 24-inch precipitation zone.

43—Castle clay, 15 to 35 percent slopes. This moderately deep, well drained soil is on uplands in the south-central part of the county. It formed in residuum derived from semiconsolidated shale. Slopes commonly are 250 to 1,000 feet long. Elevation is 4,500 to 5,600 feet. The average annual precipitation is about 22 inches, the average annual air temperature is about 40 degrees F, and the average frost-free period is about 70 days.

Included in this unit are small areas of shallow, clayey soils on knolls and ridges and deep Pekay soils on foot slopes. Also included are small areas of wet soils in slide areas.

Typically, the surface layer of this Castle soil is very dark gray clay about 3 inches thick. The upper 11 inches of the subsoil is very dark gray and dark gray clay, and the lower 4 inches is grayish brown clay. The substratum is gray clay about 14 inches thick. Gray semiconsolidated shale is at a depth of 32 inches. Depth to shale ranges from 20 to 40 inches.

Permeability is very slow. Available water capacity is low to moderate. Effective rooting depth is 20 to 40 inches. The average annual wetting depth where this soil is under native vegetation is 20 to 40 inches. Runoff is very rapid, and the hazard of water erosion is high. The hazard of soil blowing is high.

This soil is used as rangeland.

This soil is poorly suited to cultivated crops and to hay and pasture because of steepness of slope and rough topography.

The potential plant community on this soil is mainly rough fescue, Columbia needlegrass, bearded wheatgrass, and mountain brome. If the range is excessively grazed, the proportion of these plants decreases and the proportion of Idaho fescue, western wheatgrass, big sagebrush, and lupine increases. If excessive grazing continues, plants such as Kentucky bluegrass, timothy, perennial forbs, and annuals may invade. The potential plant community produces about 2,800 pounds of air-dry vegetation in years of above-normal precipitation and 2,200 pounds in years of below-normal precipitation.

The surface layer is susceptible to water erosion and soil blowing if it is disturbed or if the range is overgrazed. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and protect the soil from erosion. Because of steepness of slope, this soil is poorly suited to seeding of adapted grasses and forbs.

This soil is poorly suited to windbreaks. It is limited mainly by slope.

This soil is poorly suited to homesite development. The very slow permeability, slope, and susceptibility of the soil to sliding make homesite development impractical.

This map unit is in capability subclass VIe, nonirrigated, and in Clayey range site, 20- to 24-inch precipitation zone.

44—Castner complex, 4 to 25 percent slopes. This map unit is on uplands in the central and northwestern parts of the county. Slopes commonly are 250 to 1,000 feet long. Elevation is 3,500 to 4,600 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 115 days.

This unit is about 50 percent Castner very flaggy loam and 30 percent Castner channery loam.

Included in this unit are small areas of Castner loam, Castner sandy loam, and Castner channery sandy loam. Also included are small areas of moderately deep Hibar and Timberg soils. Included areas make up about 20 percent of the total acreage.

The Castner very flaggy loam is shallow and well drained. It formed in residuum derived dominantly from fractured hard sandstone. Typically, the surface layer is grayish brown very flaggy loam about 7 inches thick. The underlying material is pale brown very stony loam about 7 inches thick. Light gray sandstone is at a depth of 14 inches. Depth to sandstone ranges from 10 to 20 inches.

The Castner channery loam is shallow and well drained. It formed in residuum derived dominantly from fractured hard sandstone. Typically, the surface layer is grayish brown channery loam about 7 inches thick. The underlying material is pale brown very stony loam about 7 inches thick. Light gray sandstone is at a depth of 14 inches. Depth to sandstone ranges from 10 to 20 inches.

Permeability of the Castner soils is moderate. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. The average annual wetting depth where this soil is under native vegetation is 10 to 20 inches. Runoff is medium, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

The soils in this unit are used as rangeland.

These soils are poorly suited to culivated crops and to hay and pasture because of the many rock fragments in the surface layer.

The potential plant community on these soils is mainly rough fescue, bluebunch wheatgrass, plains muhly, and green needlegrass. If the range is excessively grazed, the proportion of these plants decreases and the proportion of Idaho fescue, blue grama, needleandthread, and prairie junegrass increases. If excessive grazing continues, plants such as Kentucky bluegrass, clubmoss, perennial weeds, and annuals may invade. The potential plant community produces about 1,200 pounds of air-dry vegetation in years of above-normal precipitation and 800 pounds in years of below-normal precipitation.

The surface layer is susceptible to water erosion and soil blowing if it is disturbed or if the range is overgrazed. These soils are poorly suited to mechanical treatment because of the large amount of rock fragments in the surface layer.

These soils are poorly suited to windbreaks because of the very low available water capacity.

The main limitations for homesite development on these soils are shallow depth to bedrock and content of rock fragments. The soils are severely limited for septic tank absorption fields because of the shallow depth to bedrock. Effluent from septic tank absorption fields can surface in areas downslope and thus create a hazard to health. Cuts to level building sites can expose bedrock. Removal of pebbles and cobbles in disturbed areas is needed for best results when landscaping, particularly in areas used for lawns.

This map unit is in capability subclass VIs, nonirrigated, and in Shallow range site, 15- to 19-inch precipitation zone.

45—Castner-Amherst loams, 2 to 8 percent slopes. This map unit is on uplands in the central and northwestern parts of the county. Slopes commonly are 250 to 1,000 feet long. Elevation is 3,500 to 4,600 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 105 days.

This unit is about 40 percent Castner loam and 35 percent Amherst loam. The Castner soil is in plane and convex areas, and the Amherst soil is in plane and concave areas.

Included in this unit is about 15 percent moderately deep Absarokee soils and about 10 percent Castner fine sandy loam and Castner channery fine sandy loam.

The Castner soil is shallow and well drained. It formed in residuum derived dominantly from fractured hard sandstone. Typically, the surface layer is grayish brown loam about 7 inches thick. The underlying material is pale brown very channery loam about 7 inches thick. Light gray sandstone is at a depth of 14 inches. Depth to sandstone ranges from 10 to 20 inches.

Permeability of the Castner soil is moderate. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. The average annual wetting depth where this soil is under native vegetation is 10 to 20 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

The Amherst soil is shallow and well drained. It formed in residuum derived dominantly from consolidated shale interbedded with sandstone. Typically, the surface layer is grayish brown loam about 2 inches thick. The upper 3 inches of the subsoil is grayish brown channery clay loam, and the lower 7 inches is brown channery clay. Light brownish gray shale and sandstone are at a depth of 12 inches. Depth to shale and sandstone ranges from 10 to 20 inches.

Permeability of the Amherst soil is moderately slow. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. The average annual wetting depth where this soil is under native vegetation is 10 to 20 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

The soils in this unit are used as rangeland and for hay and pasture.

These soils are poorly suited to nonirrigated crops because of the very low available water capacity and the shallow depth to sandstone and shale.

These soils are suited to hay and pasture. They are limited mainly by the very low available water capacity and the hazards of soil blowing and water erosion. Seedbed preparation and planting on the contour or across the slope, where practical, conserve moisture and help to control water erosion. Rotation grazing helps to maintain the quality of forage.

The potential plant community on these soils is mainly rough fescue, bluebunch wheatgrass, plains muhly, and green needlegrass. If the range is excessively grazed, the proportion of these plants decreases and the proportion of Idaho fescue, blue grama, needleandthread, and prairie junegrass increases. If excessive grazing continues, plants such as Kentucky bluegrass, clubmoss, perennial weeds, and annuals may invade. The potential plant community produces about 1,400 pounds of air-dry vegetation in years of above-normal precipitation and 900 pounds in years of below-normal precipitation.

This soil is suitable for seeding to adapted grasses and forbs if the range is in poor condition. Seedbed preparation and planting on the contour or across the slope, where practical, conserve moisture and help to control water erosion. The surface layer is susceptible to water erosion and soil blowing if it is disturbed or if the range is overgrazed.

These soils are poorly suited to windbreaks. They are limited mainly by the very low available water capacity.

The main limitation for homesite development on the Castner soil is shallow depth to bedrock. This soil is severely limited for septic tank absorption fields because of the shallow depth to bedrock. Cuts to level building sites can expose bedrock.

The main limitations for homesite development on the Amherst soil are moderately slow permeability, shallow depth to shale and sandstone, shrink-swell potential, and low soil strength. The soil is severely limited for septic tank absorption fields because of the moderately slow permeability and shallow depth to shale and sandstone. Cuts to level building sites can expose shale and sandstone. Shrinking and swelling and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations.

This map unit is in capability subclass VIe, nonirrigated, and in Shallow range site, 15- to 19-inch precipitation zone.

46—Cheadle stony loam, 4 to 25 percent slopes. This shallow, well drained soil is on uplands in the south-central part of the county. It formed in residuum derived from fractured hard sandstone. Slopes commonly are 250 to 1,000 feet long. Elevation is 4,700 to 6,500 feet. The average annual precipitation is about 22 inches, the average annual air temperature is about 40 degrees F, and the average frost-free period is about 70 days.

Included in this unit are small areas of Cheadle very stony loam and Cheadle extremely stony loam.

Typically, the surface layer of this Cheadle soil is dark grayish brown stony loam about 7 inches thick. The upper 8 inches of the underlying material is brown extremely channery loam, and the lower 4 inches is light

yellowish brown extremely flaggy loam. Very pale brown sandstone is at a depth of 19 inches. Depth to sandstone ranges from 10 to 20 inches.

Permeability is moderate. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. The average annual wetting depth where this soil is under native vegetation is 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

This soil is used as rangeland.

This soil is poorly suited to cultivated crops and to hay and pasture because of large stones in the surface layer.

The potential plant community on this soil is mainly rough fescue, bluebunch wheatgrass, Columbia needlegrass, and western wheatgrass. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of Idaho fescue, prairie junegrass, western wheatgrass, and timber oatgrass increases. If excessive grazing continues, plants such as broom snakeweed, onespike danthonia, perennial forbs, and annuals may invade. The potential plant community produces about 2,100 pounds of air-dry vegetation in years of above-normal precipitation and 1,300 pounds in years of below-normal precipitation.

The surface layer is susceptible to water erosion and soil blowing if it is disturbed or if the range is overgrazed. This soil is not suited to mechanical treatment because of the large stones in the surface layer.

This soil is poorly suited to windbreaks. It is limited by stoniness.

The main limitations for homesite development on this soil are shallow depth to bedrock and the content of rock fragments. The soil is severely limited for septic tank absorption fields because of the shallow depth to bedrock. Effluent from septic tank absorption fields can surface in downslope areas and thus create a hazard to health. Cuts to level building sites can expose bedrock. Removal of pebbles and cobbles in disturbed areas is needed for best results when landscaping, particularly in areas used for lawns.

This map unit is in capability subclass VIe, nonirrigated, and in Shallow range site, 20- to 24-inch precipitation zone.

47—Cheadle stony loam, 25 to 60 percent slopes. This shallow, well drained soil is on uplands in the south-central part of the county. It formed in residuum derived from fractured hard sandstone. Slopes commonly are 250 to 1,000 feet long. Elevation is 4,700 to 6,500 feet. The average annual precipitation is about 22 inches, the average annual air temperature is about 40 degrees F, and the average frost-free period is about 70 days.

Included in this unit are small areas of Cheadle very stony loam and Cheadle extremely stony loam. Also included are small areas of Rock outcrop and moderately deep soils.

Typically, the surface layer of this Cheadle soil is dark grayish brown stony loam about 7 inches thick. The upper 8 inches of the underlying material is brown extremely channery loam, and the lower 4 inches is light yellowish brown extremely flaggy loam. Very pale brown sandstone is at a depth of about 19 inches. Depth to sandstone ranges from 10 to 20 inches.

Permeability is moderate. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. The average annual wetting depth where this soil is under native vegetation is 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

This soil is used as rangeland.

This soil is poorly suited to cultivated crops and to hay and pasture because of steepness of slope and rough topography.

The potential plant community on this Cheadle soil is mainly bluebunch wheatgrass, rough fescue, Columbia needlegrass, and western wheatgrass. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of Idaho fescue, prairie junegrass, western wheatgrass, and timber oatgrass increases. If excessive grazing continues, plants such as broom snakeweed, onespike danthonia, perennial forbs, and annuals may invade. The potential plant community produces about 2,100 pounds of air-dry vegetation in years of above-normal precipitation and 1,300 pounds in years of below-normal precipitation.

Steepness of slope and areas of Rock outcrop limit access by livestock. Less sloping areas are subject to overgrazing. The surface layer is susceptible to water erosion and soil blowing if it is disturbed or if the range is overgrazed. This soil is not suited to mechanical treatment because of large stones in the surface layer, slope, and rough topography.

This soil is poorly suited to windbreaks. It is limited mainly by slope.

This soil is poorly suited to homesite development because of steepness of slope and shallow depth to bedrock.

This map unit is in capability subclass VIIe and in Shallow range site, 20- to 24-inch precipitation zone.

48—Chinook fine sandy loam, 2 to 15 percent slopes. This deep, well drained soil is on fans and foot slopes in the northeastern part of the county. It formed in alluvial and eolian material. Slopes commonly are 250 to 1,000 feet long. Elevation is 2,400 to 3,500 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 44 degrees F, and the average frost-free period is about 130 days.

Included in this unit are small areas of soils that are similar to this Chinook soil but have sandstone at a depth of 20 to 40 inches.

Typically, the surface layer of this Chinook soil is grayish brown fine sandy loam about 6 inches thick. The

upper 8 inches of the subsoil is grayish brown and light brownish gray fine sandy loam, and the lower 7 inches is light gray fine sandy loam. The substratum to a depth of 60 inches or more is light gray fine sandy loam.

Permeability is moderately rapid. Available water capacity is moderate to high. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is about 30 inches. Runoff is slow, and the hazard of water erosion is moderate. The hazard of soil blowing is high.

This soil is used as rangeland, for hay and pasture, and for nonirrigated crops such as wheat, barley, and oats.

This soil is suited to nonirrigated crops. It is limited mainly by low precipitation and the hazards of soil blowing and water erosion. Because precipitation is not sufficient for annual cropping, a cropping system that includes small grains and summer fallow is best. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, stubble-mulch tillage, and growing sod crops such as hay and pasture help to control soil blowing and water erosion.

The potential plant community on this soil is mainly bluebunch wheatgrass, prairie sandreed, western wheatgrass, and little bluestem. If the range is excessively grazed, the proportion of these plants decreases and the proportion of threadleaf sedge, needleandthread, prairie junegrass, and sand dropseed increases. If excessive grazing continues, plants such as horseweed fleabane, cheatgrass brome, pricklypear, and perennial weeds may invade. The potential plant community produces about 1,600 pounds of air-dry vegetation in years of above-normal precipitation and 1,000 pounds in years of below-normal precipitation.

This soil is suitable for seeding to adapted grasses and forbs if the range is in poor condition. Seedbed preparation and planting on the contour or across the slope, where practical, conserve moisture and help to control water erosion. The surface layer is susceptible to water erosion and soil blowing if it is disturbed or if the range is overgrazed.

This soil is suited to windbreaks, but the moderate available water capacity of the soil limits the growth of both trees and shrubs. Suitable trees for planting are Russian-olive, Siberian crabapple, green ash, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and cotoneaster. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings.

The main limitations for homesite development on this soil are potential frost action and the hazard of soil blowing. Frost action can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome this limitation. Excavation for houses and access roads may expose material that is highly susceptible to soil blowing. Preserving the existing plant cover during construction helps to control erosion.

This map unit is in capability subclass IVe, nonirrigated, and in Sandy range site, 10- to 14-inch precipitation zone.

49—Chinook fine sandy loam, 15 to 35 percent slopes. This deep, well drained soil is on uplands. It formed in alluvial and eolian material. Slopes commonly are 250 to 1,000 feet. Elevation is 2,400 to 3,500 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 44 degrees F, and the average frost-free period is about 130 days.

Included in this unit are small areas of soils that are similar to this Chinook soil but are shallow and moderately deep over sandstone. Also included are small areas of moderately deep Delpoint soils and shallow Cabbart soils on knolls and Rock outcrop on ridge crests.

Typically, the surface layer of this Chinook soil is grayish brown fine sandy loam about 6 inches thick. The upper 8 inches of the subsoil is grayish brown and light brownish gray fine sandy loam, and the lower 7 inches is light gray fine sandy loam. The substratum to a depth of 60 inches or more is light gray fine sandy loam.

Permeability is moderately rapid. Available water capacity is moderate to high. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is about 30 inches. Runoff is medium, and the hazard of water erosion is high. The hazard of soil blowing is high.

This soil is used as rangeland.

This soil is poorly suited to cultivated crops and to hay and pasture because of steepness of slope and rough topography.

The potential plant community on this soil is mainly bluebunch wheatgrass, prairie sandreed, western wheatgrass, and little bluestem. If the range is excessively grazed, the proportion of these plants decreases and the proportion of threadleaf sedge, needleandthread, prairie junegrass, and sand dropseed increases. If excessive grazing continues, plants such as horseweed fleabane, cheatgrass, pricklypear, and perennial weeds may invade. The potential plant community produces about 1,600 pounds of air-dry vegetation in years of above-normal precipitation and 1,000 pounds in years of below-normal precipitation.

The surface layer of this soil is susceptible to water erosion and soil blowing if it is disturbed or if the range is overgrazed. Mechanical treatment is not practical because of slope.

This soil is poorly suited to windbreaks. It is limited mainly by slope.

The main limitations for homesite development on this soil are slope, potential frost action, and the hazard of soil blowing. Slope is a concern in installing septic tank

absorption fields. Absorption lines should be installed on the contour. Frost action can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome this limitation. Excavation for houses and access roads expose material that is highly susceptible to soil blowing. Preserving the existing plant cover during construction helps to control erosion.

This map unit is in capability subclass VIe, nonirrigated, and in Sandy range site, 10- to 14-inch precipitation zone.

50—Crago Variant clay loam, 0 to 4 percent slopes. This deep, well drained soil is mainly on terraces in the southeastern part of the county. It formed in alluvium derived from limestone. Slopes commonly are more than 1,000 feet long. Elevation is 3,200 to 4,200 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 44 degrees F, and the average frost-free period is about 130 days.

Included in this unit are small areas of deep Crago gravelly loam and Crago gravelly clay loam and shallow Ashuelot Variant soils on ridges. Also included are small areas of deep Sanje soils on plane and concave slopes.

Typically, the surface layer of this Crago Variant soil is grayish brown clay loam about 7 inches thick. The subsoil is pale brown clay loam about 15 inches thick. The substratum to a depth of 60 inches or more is very pale brown extremely gravelly sandy loam.

Permeability is moderately slow to a depth of 22 inches and moderately rapid below this depth. Available water capacity is low. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is about 24 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

This soil is used as rangeland, for hay and pasture, and for nonirrigated crops such as wheat, barley, and oats.

This soil is suited to nonirrigated crops. It is limited mainly by the low available water capacity, low precipitation, and the hazard of soil blowing. Crops that are tolerant of drought are most suitable because the available moisture is not adequate for good growth of most other plants. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, stubble-mulch tillage, and growing sod crops such as hay and pasture help to control soil blowing.

The potential plant community on this soil is mainly bluebunch wheatgrass, western wheatgrass, green needlegrass, and thickspike wheatgrass. If the range is excessively grazed, the proportion of these plants decreases and the proportion of plains reedgrass, blue grama, prairie junegrass, and fringed sagewort increases. If excessive grazing continues, plants such as perennial weeds, broom snakeweed, clubmoss, and annuals may invade. The potential plant community produces about 800 pounds of air-dry vegetation in years of above-normal precipitation and 400 pounds in years of below-normal precipitation.

This soil is suitable for seeding to adapted grasses and forbs if the range is in poor condition. The surface layer is susceptible to soil blowing if it is disturbed or if the range is overgrazed. Rotation grazing helps to maintain the quality of forage.

This soil is suited to windbreaks, but the low available water capacity limits the growth of both trees and shrubs. Suitable trees for planting are Russian-olive, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, western sandcherry, and skunkbush sumac. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings.

The main limitations for homesite development on this soil are potential frost action, content of rock fragments, and low soil strength. Frost action and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. If the soil is used as a base for roads, the upper part can be mixed with the underlying porous material to increase its strength and stability. The extremely gravelly material of the substratum below a depth of 22 inches is good roadfill. Removal of pebbles and cobbles in disturbed areas is needed for best results when landscaping, particularly in areas used for lawns.

This map unit is in capability subclass IVs, nonirrigated, and in Clayey range site, 10- to 14-inch precipitation zone.

51—Creed-Gerdrum complex, 0 to 2 percent slopes. This map unit is on terraces in the eastern part of the county. Slopes commonly are more than 1,000 feet long. Elevation is 2,300 to 3,800 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 44 degrees F, and the average frost-free period is about 130 days.

This unit is about 70 percent Creed loam and 25 percent Gerdrum clay loam.

Included in this unit are small areas of deep Linnet and Absher soils. The Absher soils, in small depressional areas, are salt- and alkali-affected and support little vegetation. Included areas make up about 5 percent of the total acreage.

The Creed soil is deep and well drained. It formed in alluvium derived from mixed rock sources. Typically, the surface layer is pale brown loam about 5 inches thick. The subsurface layer is light gray clay loam about 3 inches thick. The upper 12 inches of the subsoil is grayish brown and brown clay, and the lower 7 inches is pale brown clay. The upper 15 inches of the substratum is pale brown clay, and the lower part to a depth of 60

inches or more is very pale brown very gravelly clay loam.

Permeability of the Creed soil is slow. Available water capacity is moderate. This soil is salt- and alkali-affected in the subsoil and substratum. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is about 22 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

The Gerdrum soil is deep and well drained. It formed in alluvium derived from mixed rock sources. Typically, the surface layer is pale brown loam about 1 1/2 inches thick. The subsurface layer is light gray clay loam about 2 inches thick. The subsoil is grayish brown clay about 23 1/2 inches thick. The substratum to a depth of 60 inches or more is olive gray and pale yellow silty clay.

Permeability of the Gerdrum soil is slow. Available water capacity is moderate. This soil is salt- and alkali-affected in the subsoil and substratum. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is about 22 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

The soils in this unit are used mainly as rangeland. They are also used for nonirrigated crops, mainly wheat, barley, alfalfa, and grass for hay and pasture.

These soils are suited to nonirrigated crops. They are limited mainly by low precipitation, moderate available water capacity, the salt- and alkali-affected subsoil and substratum, and the hazard of soil blowing. Crops that are tolerant of drought are most suitable because the available moisture is not adequate for good growth of most other crops. Subsoiling improves water infiltration and allows salts to be leached downward. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, stubble-mulch tillage, and growing sod crops such as hay and pasture help to control soil blowing.

The potential plant community on the Creed soil is mainly bluebunch wheatgrass, western wheatgrass, green needlegrass, and needleandthread. If the range is excessively grazed, the proportion of these plants decreases and the proportion of blue grama, prairie junegrass, fringed sagewort, and threadleaf sedge increases. If excessive grazing continues, plants such as pricklypear, perennial weeds, annuals, and clubmoss may invade. The potential plant community produces about 1,500 pounds of air-dry vegetation in years of above-normal precipitation and 800 pounds in years of below-normal precipitation.

The potential plant community on the Gerdrum soil is mainly western wheatgrass, thickspike wheatgrass, green needlegrass, and Nuttall saltbush. If the range is excessively grazed, the proportion of these plants decreases and the proportion of plains reedgrass, blue grama, Sandberg bluegrass, and big sagebrush increases. If excessive grazing continues, plants such as broom snakeweed, pricklypear, clubmoss, and annuals may invade. The potential plant community produces about 800 pounds of air-dry vegetation in years of above-normal precipitation and 400 pounds in years of below-normal precipitation.

These soils are suitable for seeding to adapted grasses and forbs if the range is in poor condition. The surface layer is susceptible to soil blowing if it is disturbed or if the range is overgrazed.

These soils are suited to windbreaks, but they are moderately saline, which limits the choice of trees and shrubs to those that are salt tolerant. Suitable trees for planting are Russian-olive, black hawthorn, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, common chokecherry, skunkbush sumac, and silver buffaloberry. Summer fallow, cultivation for weed control, and selection of adapted plants are needed to insure establishment and survival of seedlings.

The main limitations for homesite development on the soils in this unit are slow permeability, salinity, shrink-swell potential, corrosivity to concrete, and low soil strength. If the soils are used for septic tank absorption fields, the slow permeability can be overcome by increasing the size of the absorption field. Shrinking and swelling and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential. Use of a salt-resistant concrete is necessary to overcome the corrosivity.

This map unit is in capability subclass IVs, nonirrigated. The Creed soil is in Silty range site, 10- to 14-inch precipitation zone, and the Gerdrum soil is in Dense Clay range site, 10- to 14-inch precipitation zone.

52—Creed-Gerdrum complex, 2 to 8 percent slopes. This map unit is on fans in the eastern part of the county. Slopes commonly are 250 to 1,000 feet long. Elevation is 2,300 to 3,800 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 44 degrees F, and the average frost-free period is about 130 days.

This unit is about 65 percent Creed loam and 30 percent Gerdrum clay loam.

Included in this unit are small areas of deep Linnet and Absher soils. The Absher soils, in small depressional areas, are salt- and alkali-affected and support little vegetation. Included areas make up about 5 percent of the total acreage.

The Creed soil is deep and well drained. It formed in alluvium derived from mixed rock sources. Typically, the surface layer is pale brown loam about 5 inches thick. The subsurface layer is light gray clay loam about 3 inches thick. The upper 12 inches of the subsoil is

grayish brown and brown clay, and the lower 7 inches is pale brown clay. The upper 15 inches of the substratum is pale brown clay, and the lower part to a depth of 60 inches or more is very pale brown very gravelly clay loam.

Permeability of the Creed soil is slow. Available water capacity is moderate. This soil is salt- and alkali-affected in the subsoil and substratum. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is about 22 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

The Gerdrum soil is deep and well drained. It formed in alluvium derived from mixed rock sources. Typically, the surface layer is pale brown loam about 1 1/2 inches thick. The subsurface layer is light gray clay loam about 2 inches thick. The subsoil is grayish brown clay about 23 1/2 inches thick. The substratum to a depth of 60 inches or more is olive gray and pale yellow silty clay.

Permeability of the Gerdrum soil is slow. Available water capacity is moderate. This soil is salt- and alkali-affected in the subsoil and substratum. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is about 22 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

The soils in this unit are used mainly as rangeland. They are also used for nonirrigated crops, mainly wheat, barley, alfalfa, and grass for hay and pasture.

These soils are suited to nonirrigated crops. They are limited mainly by low precipitation, moderate available water capacity, the salt- and alkali-affected subsoil and substratum, and the hazards of soil blowing and water erosion. Crops that are tolerant of drought are most suitable because the available moisture is not adequate for good growth of most other crops. Subsoiling improves water infiltration and allows salts to be leached downward. Minimum tillage, contour cultivation, grassed waterways, stubble-mulch tillage, and growing sod crops such as hay and pasture help to control soil blowing and water erosion. Tall grass barriers trap snow, which increases the amount of moisture in the soil.

The potential plant community on the Creed soil is mainly bluebunch wheatgrass, western wheatgrass, green needlegrass, and needleandthread. If the range is excessively grazed, the proportion of these plants decreases and the proportion of blue grama, prairie junegrass, fringed sagewort, and threadleaf sedge increases. If excessive grazing continues, plants such as pricklypear, perennial weeds, annuals, and clubmoss may invade. The potential plant community produces about 1,500 pounds of air-dry vegetation in years of above-normal precipitation and 800 pounds in years of below-normal precipitation.

The potential plant community on the Gerdrum soil is mainly western wheatgrass, thickspike wheatgrass, green needlegrass, and Nuttall saltbush. If the range is excessively grazed, the proportion of these plants decreases and the proportion of plains reedgrass, blue grama, Sandberg bluegrass, and big sagebrush increases. If excessive grazing continues, plants such as broom snakeweed, pricklypear, clubmoss, and annuals may invade. The potential plant community produces about 800 pounds of air-dry vegetation in years of above-normal precipitation and 400 pounds in years of below-normal precipitation.

These soils are suitable for seeding to adapted grasses and forbs if the range is in poor condition. Seedbed preparation and planting on the contour or across the slope, where practical, conserve moisture and help to control water erosion. The surface layer is susceptible to water erosion and soil blowing if it is disturbed or if the range is overgrazed.

These soils are suited to windbreaks, but they are moderately saline, which limits the choice of trees and shrubs to those that are salt tolerant. Suitable trees for planting are Russian-olive, black hawthorn, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, common chokecherry, skunkbush sumac, and silver buffaloberry. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings.

The main limitations for homesite development on the soils in this unit are slow permeability, salinity, shrink-swell potential, corrosivity to concrete, and low soil strength. If the soils are used for septic tank absorption fields, the slow permeability can be overcome by increasing the size of the absorption field. Shrinking and swelling and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential. Use of a salt-resistant concrete is necessary to overcome the corrosivity.

This map unit is in capability subclass IVe, nonirrigated. The Creed soil is in Silty range site, 10- to 14-inch precipitation zone, and the Gerdrum soil is in Dense Clay range site, 10- to 14-inch precipitation zone.

53—Daglum-Adger complex, 0 to 2 percent slopes. This map unit is on terraces and fans in the central and western parts of the county. Slopes commonly are 250 to 1,000 feet long. Elevation is 3,400 to 4,000 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 120 days.

This unit is about 60 percent Daglum clay loam and 30 percent Adger clay.

Included in this unit are small areas of deep Savage and Nobe soils. The Nobe soils are salt- and alkali-affected and support little vegetation. Included areas make up about 10 percent of the total acreage.

The Daglum soil is deep and moderately well drained. It formed in alluvium derived from mixed rock sources. Typically, the surface layer is brown clay loam about 7 inches thick. The subsurface layer is light brownish gray clay loam about 3 inches thick. The upper 7 inches of the subsoil is grayish brown clay, and the lower 13 inches is light brownish gray clay. The substratum to a depth of 60 inches or more is grayish brown clay.

Permeability of the Daglum soil is very slow. Available water capacity is moderate to high. This soil is salt- and alkali-affected in the subsoil and substratum. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is about 26 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

The Adger soil is deep and moderately well drained. It formed in alluvium derived from mixed rock sources. Typically, the surface layer is grayish brown clay about 6 inches thick. The upper 3 inches of the subsoil is dark grayish brown clay, the next 5 inches is grayish brown clay, and the lower 23 inches is dark grayish brown clay. The substratum to a depth of 60 inches or more is light olive brown clay.

Permeability of the Adger soil is very slow. Available water capacity is moderate to low. This soil is salt- and alkali-affected in the subsoil and substratum. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is about 26 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high.

The soils in this unit are used mainly as rangeland. They are also used for hay and pasture and for nonirrigated crops such as wheat, barley, and oats.

These soils are suited to nonirrigated crops. They are limited mainly by the content of salts and alkali in the subsoil, restricted drainage, and the hazard of soil blowing. Intensive management is required to reduce the salinity and maintain soil productivity. Subsoiling improves water infiltration and allows salts to be leached downward. Soil blowing can be reduced by returning crop residue to the soil, practicing minimum tillage, and growing sod crops such as hay and pasture.

The potential plant community on the Daglum soil is mainly bluebunch wheatgrass, green needlegrass, western wheatgrass, and needleandthread. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of blue grama, western wheatgrass, Sandberg bluegrass, and inland saltgrass increases. If excessive grazing continues, plants such as Kentucky bluegrass, perennial weeds, and annuals may invade. The potential plant community produces about 1,500 pounds of air-dry vegetation in years of above-normal precipitation and 700 pounds in years of below-normal precipitation.

The potential plant community on the Adger soil is mainly western wheatgrass, green needlegrass, thickspike wheatgrass, and Nuttall saltbush. If the range is excessively grazed, the proportion of these plants decreases and the proportion of Sandberg bluegrass, bottlebrush squirreltail, sand dropseed, and big sagebrush increases. If excessive grazing continues, plants such as foxtail barley, pricklypear, tumblegrass, and annual saltbush may invade. The potential plant community produces about 800 pounds of air-dry vegetation in years of above-normal precipitation and 400 pounds in years of below-normal precipitation.

These soils are suitable for seeding to adapted grasses and forbs if the range is in poor condition. The surface layer is susceptible to soil blowing if it is disturbed or the range is overgrazed.

These soils are suited to windbreaks, but they are strongly saline, which limits the choice of trees and shrubs to Russian-olive and silver buffaloberry, respectively. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings.

The main limitations for homesite development on the soils in this unit are very slow permeability, depth to the seasonal high water table, salinity, shrink-swell potential, potential frost action, corrosivity to concrete, and low soil strength. If the soils are used for septic tank absorption fields, the very slow permeability can be overcome by increasing the size of the absorption field. Deep drainage reduces wetness. Shrinking and swelling, frost action, and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential. Use of a salt-resistant concrete is necessary to overcome the corrosivity.

This map unit is in capability subclass IVs, nonirrigated. The Daglum soil is in Silty range site, 15- to 19-inch precipitation zone, and the Adger soil is in Dense Clay range site, 15- to 19-inch precipitation zone.

54—Daglum-Adger complex, 2 to 8 percent slopes. This map unit is on fans and terraces in the central and western parts of the county. Slopes commonly are 250 to 1,000 feet long. Elevation is 3,200 to 4,200 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 120 days.

This unit is about 50 percent Daglum loam and 30 percent Adger clay.

Included in this unit are areas of deep Gerber soils and small areas of deep Nobe soils. The Nobe soils are salt- and alkali-affected and support little vegetation. Included areas make up about 20 percent of the total acreage.

The Daglum soil is deep and moderately well drained. It formed in alluvium derived from mixed rock sources. Typically, the surface layer is brown loam about 7 inches thick. The subsurface layer is light brownish gray loam about 3 inches thick. The upper 7 inches of the subsoil is grayish brown clay, and the lower 13 inches is light brownish gray clay. The substratum to a depth of 60 inches or more is grayish brown clay.

Permeability of the Daglum soil is very slow. Available water capacity is moderate to high. This soil is salt- or alkali-affected in the subsoil and substratum. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is about 26 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

The Adger soil is deep and moderately well drained. It formed in alluvium derived from mixed rock sources. Typically, the surface layer is grayish brown clay about 6 inches thick. The upper 3 inches of the subsoil is dark grayish brown clay, the next 5 inches is grayish brown clay, and the lower 23 inches is dark grayish brown clay. The substratum to a depth of 60 inches or more is light olive brown clay.

Permeability of the Adger soil is very slow. Available water capacity is moderate to low. This soil is salt- and alkali-affected in the subsoil and substratum. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is about 26 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high.

The soils in this unit are used mainly as rangeland. They are also used for hay and pasture and for nonirrigated crops such as wheat, barley, and oats.

These soils are suited to nonirrigated crops. They are limited mainly by the content of salts and alkali in the subsoil and by the hazards of water erosion and soil blowing. Intensive management is required to reduce the salinity and maintain soil productivity. Subsoiling improves water infiltration and allows salts to be leached downward. Minimum tillage, contour cultivation, grassed waterways, stubble-mulch tillage, and growing sod crops such as hay and pasture help to control soil blowing and water erosion.

The potential plant community on the Daglum soil is mainly bluebunch wheatgrass, green needlegrass, western wheatgrass, and needleandthread. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of blue grama, western wheatgrass, Sandberg bluegrass, and inland saltgrass increases. If excessive grazing continues, plants such as Kentucky bluegrass, perennial weeds, and annuals may invade. The potential plant community produces about 1,500 pounds of air-dry vegetation in years of above-normal precipitation and 700 pounds in years of below-normal precipitation.

The potential plant community on the Adger soil is mainly western wheatgrass, green needlegrass, thickspike wheatgrass, and Nuttall saltbush. If the range is excessively grazed, the proportion of these plants decreases and the proportion of Sandberg bluegrass, bottlebrush squirreltail, sand dropseed, and big sagebrush increases. If excessive grazing continues, plants such as foxtail barley, pricklypear, tumblegrass, and annual saltbush may invade. The potential plant community produces about 800 pounds of air-dry vegetation in years of above-normal precipitation and 400 pounds in years of below-normal precipitation.

These soils are suitable for seeding to adapted grasses and forbs if the range is in poor condition. Seedbed preparation and planting on the contour or across the slope, where practical, conserve moisture and help to control water erosion. The surface layer is susceptible to water erosion and soil blowing if it is disturbed or the range is overgrazed.

These soils are suited to windbreaks, but they are strongly saline, which limits the choice of trees and shrubs to Russian-olive and silver buffaloberry, respectively. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings.

The main limitations for homesite development on the soils in this unit are very slow permeability, depth to the seasonal high water table, salinity, shrink-swell potential, potential frost action, corrosivity to concrete, and low soil strength. If the soils are used for septic tank absorption fields, the very slow permeability can be overcome by increasing the size of the absorption field. Deep drainage reduces wetness. Shrinking and swelling, frost action, and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential. Use of a salt-resistant concrete is necessary to overcome the corrosivity.

This map unit is in capability subclass IVe, nonirrigated. The Daglum soil is in Silty range site, 15- to 19-inch precipitation zone, and the Adger soil is in Dense Clay range site, 15- to 19-inch precipitation zone.

55—Danvers clay loam, 0 to 2 percent slopes. This deep, well drained soil is on terraces in the western and central parts of the county. It formed in alluvium derived dominantly from limestone. Slopes commonly are more than 1,000 feet long. Elevation is 3,500 to 4,200 feet.

The average annual precipitation is about 16 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 120 days.

Included in this unit are small areas of deep Fairfield, Judell, and Tamaneen soils.

Typically, the surface layer of this Danvers soil is dark grayish brown loam about 2 inches thick. The next layer is dark grayish brown silty clay loam about 2 inches thick. The upper 10 inches of the subsoil is brown silty clay, and the lower 3 inches is grayish brown clay. The upper 10 inches of the substratum is light yellowish brown clay, the next 17 inches is very pale brown clay loam, and the lower part to a depth of 60 inches or more is very pale brown gravelly clay loam.

Permeability is slow to a depth of 44 inches and moderately slow below this depth. Available water capacity is high. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is about 26 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

This soil is used for nonirrigated crops, mainly wheat, barley, oats, alfalfa, and grass for hay and pasture. It is also used as rangeland.

This soil is well suited to nonirrigated crops. It is limited mainly by limited precipitation and the hazard of soil blowing. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, stubble-mulch tillage, and growing sod crops such as hay and pasture help to control soil blowing.

The potential plant community on this soil is mainly bluebunch wheatgrass, green needlegrass, western wheatgrass, and Idaho fescue. If the range is excessively grazed, the proportion of these plants decreases and the proportion of Idaho fescue, plains reedgrass, Sandberg bluegrass, and blue grama increases. If excessive grazing continues, plants such as broom snakeweed, Kentucky bluegrass, perennial weeds, and annuals may invade. The potential plant community produces about 2,300 pounds of air-dry vegetation in years of above-normal precipitation and 1,700 pounds in years of below-normal precipitation.

This soil is suitable for seeding to adapted grasses and forbs if the range is in poor condition. The surface layer is susceptible to soil blowing if it is disturbed or if the range is overgrazed.

This soil is well suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian crabapple, green ash, Siberian elm, white willow, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and cotoneaster. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings.

The main limitations for homesite development on this soil are the moderately slow permeability of the substratum, shrink-swell potential, and low soil strength. If the soil is used for septic tank absorption fields, the moderately slow permeability can be overcome by increasing the size of the absorption field. Shrinking and swelling and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential.

This map unit is in capability subclass IIIc, nonirrigated, and in Clayey range site, 15- to 19-inch precipitation zone.

56—Danvers clay loam, 2 to 8 percent slopes. This deep, well drained soil is on terraces in the western and central parts of the county. It formed in alluvium derived dominantly from limestone. Slopes commonly are 250 to 1,000 feet long. Elevation is 3,500 to 4,200 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 120 days.

Included in this unit are small areas of deep Fairfield, Judell, and Tamaneen soils.

Typically, the surface layer of this Danvers soil is dark grayish brown clay loam about 2 inches thick. The next layer is dark grayish brown silty clay loam about 2 inches thick. The upper 10 inches of the subsoil is brown silty clay, and the lower 3 inches is grayish brown clay. The upper 10 inches of the substratum is light yellowish brown clay, the next 17 inches is very pale brown clay loam, and the lower part to a depth of 60 inches or more is very pale brown gravelly clay loam.

Permeability is slow to a depth of 44 inches and moderately slow below this depth. Available water capacity is high. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is about 26 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

This soil is used for nonirrigated crops, mainly wheat, barley, oats, alfalfa, and grass for hay and pasture. It is also used as rangeland.

This soil is well suited to nonirrigated crops. It is limited mainly by limited precipitation and the hazards of water erosion and soil blowing. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, and stubble-mulch tillage help to control soil blowing. Seedbed preparation and planting on the contour or across the slope, where practical, help to control water erosion. Growing crops such as hay and pasture also helps to control soil blowing and water erosion.

This soil is well suited to hay and pasture. It is limited mainly by low precipitation and the hazards of water erosion and soil blowing. Seedbed preparation and planting on the contour or across the slope, where

practical, help to control water erosion. Proper grazing practices, weed control, and fertilizer are needed to insure highest quality forage.

The potential plant community on this soil is mainly bluebunch wheatgrass, green needlegrass, western wheatgrass, and Idaho fescue. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of Idaho fescue, plains reedgrass, Sandberg bluegrass, and blue grama increases. If excessive grazing continues, plants such as broom snakeweed, Kentucky bluegrass, perennial weeds, and annuals may invade. The potential plant community produces about 2,300 pounds of air-dry vegetation in years of above-normal precipitation and 1,700 pounds in years of below-normal precipitation.

This soil is suitable for seeding to adapted grasses and forbs if the range is in poor condition. Seedbed preparation and planting on the contour or across the slope, where practical, help to control water erosion. The surface layer is susceptible to water erosion and soil blowing if it is disturbed or if the range is overgrazed.

This soil is well suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian crabapple, green ash, Siberian elm, white willow, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and cotoneaster. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings.

The main limitations for homesite development on this soil are the moderately slow permeability of the substratum, shrink-swell potential, and low soil strength If the soil is used for septic tank absorption fields, the moderately slow permeability can be overcome by increasing the size of the absorption field. Shrinking and swelling and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential.

This map unit is in capability subclass IIIe, nonirrigated, and in Clayey range site, 15- to 19-inch precipitation zone.

57—Danvers-Acel clay loams, 0 to 2 percent slopes. This map unit is on terraces in the western and central parts of the county. Slopes commonly are 250 to 1,000 feet long. Elevation is 3,500 to 4,200 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 120 days.

This unit is about 60 percent Danvers clay loam and 30 percent Acel clay loam. The Danvers soil is in plane areas, and the Acel soil is in concave areas.

Included in this unit is about 10 percent deep Fairfield soils.

The Danvers soil is deep and well drained. It formed in alluvium derived dominantly from limestone. Typically, the surface layer is dark grayish brown clay loam about 2 inches thick. The next layer is dark grayish brown silty clay loam about 2 inches thick. The upper 10 inches of the subsoil is brown silty clay, and the lower 3 inches is grayish brown clay. The upper 10 inches of the substratum is light yellowish brown clay, the next 17 inches is very pale brown clay loam, and the lower part to a depth of 60 inches or more is very pale brown gravelly clay loam.

Permeability of the Danvers soil is slow to a depth of 44 inches and moderately slow below this depth. Available water capacity is high. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is about 26 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

The Acel soil is deep and well drained. It formed in alluvium derived dominantly from limestone. Typically, the surface layer is grayish brown clay loam about 6 inches thick. The upper 11 inches of the subsoil is dark grayish brown and grayish brown clay, and the lower 8 inches is light brownish gray silty clay loam. The upper 8 inches of the substratum is light brownish gray silty clay loam, and the lower part to a depth of 60 inches or more is light gray clay loam.

Permeability of the Acel soil is slow. Available water capacity is high. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is about 26 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

The soils in this unit are used for nonirrigated crops, mainly wheat, barley, oats, alfalfa, and grass for hay and pasture. They are also used as rangeland.

These soils are suited to nonirrigated crops. They are limited mainly by low precipitation, the hazard of soil blowing, and crusting of the surface of the Acel soil. Crusting can be reduced by returning crop residue to the soil. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, stubble-mulch tillage, and growing sod crops such as hay and pasture help to control soil blowing.

The potential plant community on the Danvers soil is mainly bluebunch wheatgrass, green needlegrass, western wheatgrass, and Idaho fescue. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of Idaho fescue, plains reedgrass, Sandberg bluegrass, and blue grama increases. If excessive grazing continues, plants such as broom snakeweed, Kentucky bluegrass, perennial weeds, and annuals may invade. The potential plant community produces about 2,300 pounds of air-dry

vegetation in years of above-normal precipitation and 1,700 pounds in years of below-normal precipitation.

The potential plant community on the Acel soil is mainly bluebunch wheatgrass, western wheatgrass, green needlegrass, and Montana wheatgrass. If the range is excessively grazed, the proportion of these plants decreases and the proportion of blue grama, bottlebrush squirreltail, Sandberg bluegrass, and plains reedgrass increases. If excessive grazing continues, plants such as clubmoss, pricklypear, tumblegrass, and annuals may invade. The potential plant community produces about 1,400 pounds of air-dry vegetation in years of above-normal precipitation and 800 pounds in years of below-normal precipitation.

These soils are suitable for seeding to adapted grasses and forbs if the range is in poor condition. The surface layer is susceptible to soil blowing if it is disturbed or if the range is overgrazed.

These soils are well suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian crabapple, green ash, Siberian elm, white willow, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and cotoneaster. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings.

The main limitations for homesite development on the soils in this unit are the moderately slow permeability of the substratum of the Danvers soil, the slow permeability of the Acel soil, shrink-swell potential, and low soil strength. If the soils are used for septic tank absorption fields, the moderately slow and slow permeability can be overcome by increasing the size of the absorption field. Shrinking and swelling and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential.

This map unit is in capability subclass IIIs, nonirrigated, and in Clayey range site, 15- to 19-inch precipitation zone.

58—Danvers-Tamaneen clay loams, 0 to 2 percent slopes. This map unit is on terraces in the western and central parts of the county. Slopes commonly are more than 1,000 feet long. Elevation is 3,500 to 4,200 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 120 days.

This unit is about 40 percent Danvers clay loam and 40 percent Tamaneen clay loam.

Included in this unit are small areas of deep Fairfield and Judith soils. Included areas make up about 20 percent of the total acreage.

The Danvers soil is deep and well drained. It formed in alluvium derived dominantly from limestone. Typically, the surface layer is dark grayish brown loam about 2 inches thick. The next layer is dark grayish brown silty clay loam about 2 inches thick. The upper 10 inches of the subsoil is brown silty clay, and the lower 3 inches is grayish brown clay. The upper 10 inches of the substratum is light yellowish brown clay, the next 17 inches is very pale brown clay loam, and the lower part to a depth of 60 inches or more is very pale brown gravelly clay loam.

Permeability of the Danvers soil is slow to a depth of 44 inches and moderately slow below this depth. Available water capacity is high. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is about 26 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

The Tamaneen soil is deep and well drained. It formed in alluvium derived dominantly from limestone. Typically, the surface layer is dark grayish brown clay loam about 7 inches thick. The upper 6 inches of the subsoil is grayish brown silty clay, and the lower 4 inches is pale brown clay loam. The upper 5 inches of the substratum is very pale brown very gravelly loam, and the lower part to a depth of 66 inches or more is very pale brown extremely gravelly sandy loam.

Permeability of the Tamaneen soil is moderately slow to a depth of about 22 inches and moderately rapid below this depth. Available water capacity is low to moderate. Effective rooting depth is 66 inches or more. The average annual wetting depth where this soil is under native vegetation is about 26 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

The soils in this unit are used for nonirrigated crops, mainly wheat, barley, oats, alfalfa, and grass for hay and pasture. They are also used as rangeland.

These soils are well suited to nonirrigated crops. They are limited mainly by low precipitation, the low to moderate available water capacity of the Tamaneen soil, and the hazard of soil blowing. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, stubble-mulch tillage, and growing sod crops such as hay and pasture help to control soil blowing.

The potential plant community on these soils is mainly bluebunch wheatgrass, green needlegrass, western wheatgrass, and Idaho fescue. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of Idaho fescue, plains reedgrass, Sandberg bluegrass, and blue grama increases. If excessive grazing continues, plants such as broom snakeweed, Kentucky bluegrass, perennial weeds, and annuals may invade. The potential plant community produces about 2,300 pounds of air-dry vegetation in years of above-normal precipitation and 1,600 pounds in years of below-normal precipitation.

These soils are suitable for seeding to adapted grasses and forbs if the range is in poor condition. The surface layer is susceptible to soil blowing if it is disturbed or if the range is overgrazed.

The Danvers soil is well suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian crabapple, green ash, Siberian elm, white willow, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and cotoneaster.

The Tamaneen soil is suited to windbreaks, but the moderate to low available water capacity of the soil limits the growth of both trees and shrubs. Suitable trees for planting are Russian-olive, Siberian crabapple, green ash, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and cotoneaster.

Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings on these soils.

The main limitations for homesite development on the soils in this unit are the moderately slow permeability of the substratum of the Danvers soil, shrink-swell potential, and low soil strength. If the Danvers soil is used for septic tank absorption fields, the moderately slow permeability can be overcome by increasing the size of the absorption field. Shrinking and swelling and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential.

This map unit is in capability subclass IIIc, nonirrigated, and in Clayey range site, 15- to 19-inch precipitation zone.

59—Darret loam, 2 to 8 percent slopes. This moderately deep, well drained soil is on uplands in the central part of the county. It formed in residuum derived from semiconsolidated shale interbedded with sandstone. Slopes commonly are 250 to 1,000 feet long. Elevation is 4,000 to 4,800 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 120 days.

Included in this unit are small areas of moderately deep Timberg and Terrad soils.

Typically, the surface layer of this Darret soil is brown loam about 6 inches thick. The next layer is a dark reddish gray clay loam about 2 inches thick. The upper 9 inches of the subsoil is reddish brown silty clay, and the lower 6 inches is light reddish brown silty clay. The substratum is reddish brown and light yellowish brown silty clay about 9 inches thick. Reddish brown semiconsolidated shale is at a depth of about 32 inches. Depth to shale ranges from 20 to 40 inches.

Permeability is slow. Available water capacity is low to moderate. Effective rooting depth is 20 to 40 inches. The average annual wetting depth where this soil is under native vegetation is 20 to 26 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

This soil is used for nonirrigated crops, mainly wheat, barley, oats, alfalfa, and grass for hay and pasture. It is also used as rangeland.

This soil is well suited to nonirrigated crops. It is limited mainly by the low to moderate available water capacity and the hazards of water erosion and soil blowing. Minimum tillage, contour cultivation, stripcropping, tall grass barriers, grassed waterways, and return of crop residue to the soil help to control soil blowing and water erosion. Tall grass barriers also reduce evaporation and trap snow, which increases the amount of moisture in the soil. Chiseling through stubble in fall on the contour or across the slope and growing sod crops such as hay and pasture help to control water erosion.

The potential plant community on this soil is mainly western wheatgrass, bluebunch wheatgrass, green needlegrass, and rough fescue. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of Idaho fescue, western wheatgrass, plains reedgrass, and Sandberg bluegrass increases. If excessive grazing continues, plants such as broom snakeweed, Kentucky bluegrass, perennial weeds, and annuals may invade. The potential plant community produces about 2,200 pounds of air-dry vegetation in years of above-normal precipitation and 1,800 pounds in years of below-normal precipitation.

This soil is suitable for seeding to adapted grasses and forbs if the range is in poor condition. Seedbed preparation and planting on the contour or across the slope, where practical, conserve moisture and help to control water erosion. The surface layer is susceptible to water erosion and soil blowing if it is disturbed or if the range is overgrazed.

This soil is suited to windbreaks, but the low to moderate available water capacity of the soil limits the growth of both trees and shrubs. Suitable trees for planting are Russian-olive, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, western sandcherry, and skunkbush sumac. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings.

The main limitations for homesite development on this soil are slow permeability, moderate depth to shale, shrink-swell potential, and low soil strength. The soil is severely limited for septic tank absorption fields because of the slow permeability and moderate depth to shale. Cuts to level building sites can expose shale. Shrinking

and swelling and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential.

This map unit is in capability subclass IIIe, nonirrigated, and in Silty range site, 15- to 19-inch precipitation zone.

60—Darret clay loam, 2 to 8 percent slopes. This moderately deep, well drained soil is on uplands in the central part of the county. It formed in residuum derived from semiconsolidated shale interbedded with sandstone. Slopes commonly are 250 to 1,000 feet long. Elevation is 4,000 to 4,800 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 120 days.

Included in this unit are small areas of moderately deep Timberg and Terrad soils and shallow Castner soils.

Typically, the surface layer of the Darret soil is brown clay loam about 6 inches thick. The next layer is dark reddish gray clay loam about 2 inches thick. The upper 9 inches of the subsoil is reddish brown silty clay, and the lower 6 inches is light reddish brown silty clay. The substratum is reddish brown and light yellowish brown silty clay about 9 inches thick. Reddish brown semiconsolidated shale is at a depth of about 32 inches. Depth to shale ranges from 20 to 40 inches.

Permeability is slow. Available water capacity is low to moderate. Effective rooting depth is 20 to 40 inches. The average annual wetting depth where this soil is under native vegetation is 20 to 26 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

This soil is used for nonirrigated crops, mainly wheat, barley, oats, alfalfa, and grass for hay and pasture. It is also used as rangeland.

This soil is well suited to nonirrigated crops. It is limited mainly by the low to moderate available water capacity and the hazards of water erosion and soil blowing. Minimum tillage, contour cultivation, stripcropping, tall grass barriers, grassed waterways, and return of crop residue to the soil help to control soil blowing and water erosion. Tall grass barriers also reduce evaporation and trap snow, which increases the amount of moisture in the soil. Returning crop residue to the soil also helps to maintain good soil tilth. Chiseling through stubble in fall on the contour or across the slope helps to control water erosion. Growing crops such as hay and pasture also helps to control soil blowing.

The potential plant community on this soil is mainly western wheatgrass, bluebunch wheatgrass, green needlegrass, and rough fescue. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of Idaho fescue, western wheatgrass, plains reedgrass, and Sandberg bluegrass increases. If excessive grazing continues, plants such as broom snakeweed, Kentucky bluegrass, perennial weeds, and annuals may invade. The potential plant community produces about 2,200 pounds of air-dry vegetation in years of above-normal precipitation and 1,800 pounds in years of below-normal precipitation.

This soil is suitable for seeding to adapted grasses and forbs if the range is in poor condition. Seedbed preparation and planting on the contour or across the slope, where practical, conserve moisture and help to control water erosion. The surface layer is susceptible to water erosion and soil blowing if it is disturbed or if the range is overgrazed.

This soil is suited to windbreaks, but the low to moderate available water capacity of the soil limits the growth of both trees and shrubs. Suitable trees for planting are Russian-olive, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, western sandcherry, and skunkbush sumac. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings.

The main limitations for homesite development on this soil are slow permeability, moderate depth to shale, shrink-swell potential, and low soil strength. The soil is severely limited for septic tank absorption fields because of the slow permeability and moderate depth to shale. Cuts to level building sites can expose shale. Shrinking and swelling and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential.

This map unit is in capability subclass IIIe, nonirrigated, and in Clayey range site, 15- to 19-inch precipitation zone.

61—Darret-Terrad complex, 8 to 15 percent slopes. This map unit is on uplands in the central part of the county. Slopes commonly are less than 250 feet long. Elevation is 4,000 to 4,800 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 120 days.

This unit is about 50 percent Darret clay loam and 40 percent Terrad silty clay.

Included in this unit are small areas of moderately deep Timberg soils and shallow Castner soils. Included areas make up about 10 percent of the total acreage.

The Darret soil is moderately deep and well drained. It formed in residuum derived dominantly from semiconsolidated shale interbedded with sandstone. Typically, the surface layer is brown clay loam about 6

inches thick. The next layer is dark reddish gray clay loam about 2 inches thick. The upper 9 inches of the subsoil is reddish brown silty clay, and the lower 6 inches is light reddish brown silty clay. The substratum is reddish brown and light yellowish brown silty clay 9 inches thick. Reddish brown semiconsolidated shale is at a depth of about 32 inches. Depth to shale ranges from 20 to 40 inches.

Permeability of the Darret soil is slow. Available water capacity is low to moderate. Effective rooting depth is 20 to 40 inches. The average annual wetting depth where this soil is under native vegetation is 20 to 26 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

The Terrad soil is deep and well drained. It formed in alluvium and residuum derived dominantly from semiconsolidated shale. Typically, the surface layer is dark grayish brown silty clay about 7 inches thick. The subsoil is reddish brown silty clay about 33 inches thick. The substratum is reddish brown silty clay about 9 inches thick. Reddish brown semiconsolidated shale is at a depth of 49 inches. Depth to shale ranges from 40 to 60 inches.

Permeability of the Terrad soil is slow. Available water capacity is moderate. Effective rooting depth is 40 to 60 inches. The average annual wetting depth where this soil is under native vegetation is about 26 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is high.

The soils in this unit are used for nonirrigated crops, mainly wheat, barley, oats, alfalfa, and grass for hay and pasture. They are also used as rangeland.

These soils are suited to nonirrigated crops. They are limited mainly by the hazards of water erosion and soil blowing and the low to moderate available water capacity of the Darret soil. Minimum tillage, contour cultivation, grassed waterways, stubble-mulch tillage, and growing sod crops such as hay and pasture help to control soil blowing and water erosion.

The potential plant community on these soils is mainly western wheatgrass, bluebunch wheatgrass, green needlegrass, and Idaho fescue. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of Idaho fescue, plains reedgrass, Sandberg bluegrass, and western wheatgrass increases. If excessive grazing continues, plants such as broom snakeweed, Kentucky bluegrass, perennial weeds, and annuals may invade. The potential plant community produces about 2,300 pounds of air-dry vegetation in years of above-normal precipitation and 1,700 pounds in years of below-normal precipitation.

These soils are suitable for seeding to adapted grasses and forbs if the range is in poor condition. Seedbed preparation and planting on the contour or across the slope, where practical, conserve moisture and help to control water erosion. The surface layer is susceptible to water erosion and soil blowing if it is disturbed or if the range is overgrazed.

The Darret soil is suited to windbreaks, but the low to moderate available water capacity of the soil limits the growth of both trees and shrubs. Suitable trees for planting are Russian-olive, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, western sandcherry, and skunkbush sumac.

The Terrad soil is suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian crabapple, green ash, Siberian elm, white willow, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and cotoneaster.

Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings on these soils. Planting on the contour helps to conserve moisture.

The main limitations for homesite development on the soils in this unit are slow permeability, shrink-swell potential, low soil strength, and moderate depth to shale in the Darret soil. These soils are severely limited for septic tank absorption fields because of the slow permeability and moderate depth to shale in the Darret soil. Shrinking and swelling and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential.

This map unit is in capability subclass IVe, nonirrigated, and in Clayey range site, 15- to 19-inch precipitation zone.

62—Delpoint-Yawdim complex, 4 to 8 percent slopes. This map unit is on uplands in the northeastern part of the county. Slopes commonly are less than 250 feet long. Elevation is 2,600 to 3,800 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 44 degrees F, and the average frost-free period is about 130 days.

This unit is about 50 percent Delpoint loam and 35 percent Yawdim silty clay loam. The Delpoint soil is on plane and concave side slopes, and the Yawdim soil is on convex side slopes.

Included in this unit are small areas of shallow Cabbart and Rentsac soils on knolls and deep Yamac soils on foot slopes. Included areas make up about 15 percent of the total acreage.

The Delpoint soil is moderately deep and well drained. It formed in residuum derived dominantly from weakly consolidated, sandy and silty sedimentary beds. Typically, the surface layer is grayish brown loam about 3 inches thick. The upper 8 inches of the subsoil is light

brownish gray loam, and the lower 6 inches is light gray loam. The substratum is light gray loam about 8 inches thick. Light gray, weakly consolidated, sandy and silty sedimentary beds are at a depth of about 25 inches. Depth to sedimentary beds ranges from 20 to 40 inches.

Permeability of the Delpoint soil is moderate. Available water capacity is low. Effective rooting depth is 20 to 40 inches. The average annual wetting depth where this soil is under native vegetation is 20 to 24 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

The Yawdim soil is shallow and well drained. It formed in residuum derived dominantly from semiconsolidated shale. Typically, the surface layer is grayish brown silty clay loam about 3 inches thick. The underlying material is grayish brown silty clay loam about 9 inches thick. Grayish brown, gray, and light olive brown semiconsolidated shale is at a depth of about 12 inches. Depth to shale ranges from 10 to 20 inches.

Permeability of the Yawdim soil is slow. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. The average annual wetting depth where this soil is under native vegetation is 10 to 20 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high.

The soils in this unit are used for nonirrigated crops, mainly wheat, barley, oats, alfalfa, and grass for hay and pasture. They are also used as rangeland.

These soils are suited to nonirrigated crops. They are limited mainly by low precipitation, the hazards of soil blowing and water erosion, and the very low available water capacity of the Yawdim soil. Crops that are tolerant of drought are most suitable because the available moisture is not adequate for good growth of most other crops. Minimum tillage, contour cultivation, grassed waterways, stubble-mulch tillage, and growing sod crops such as hay and pasture help to control soil blowing and water erosion. Tall grass barriers trap snow, which increases the amount of moisture in the soil.

The potential plant community on the Delpoint soil is mainly bluebunch wheatgrass, western wheatgrass, green needlegrass, needleandthread. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, blue grama, prairie junegrass, and fringed sagewort increases. If excessive grazing continues, plants such as pricklypear, perennial weeds, annuals, and clubmoss may invade. The potential plant community produces about 1,400 pounds of air-dry vegetation in years of above-normal precipitation and 700 pounds in years of below-normal precipitation.

The potential plant community on the Yawdim soil is mainly western wheatgrass, plains reedgrass, plains muhly, and green needlegrass. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of fringed sagewort, plains reedgrass, blue grama, and wild rose increases. If excessive grazing continues, plants such as broom snakeweed, creeping juniper, perennial weeds, and annuals may invade. The potential plant community produces about 700 pounds of air-dry vegetation in years of above-normal precipitation and 300 pounds in years of below-normal precipitation.

These soils are suitable for seeding to adapted grasses and forbs if the range is in poor condition. Seedbed preparation and planting on the contour or across the slope, where practical, conserve moisture and help to control water erosion. The surface layer is susceptible to water erosion and soil blowing if it is disturbed or if the range is overgrazed.

The Delpoint soil is suited to windbreaks, but the low available water capacity limits the growth of both trees and shrubs. Suitable trees for planting are Russian-olive, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, western sandcherry, and skunkbush sumac. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings. Planting on the contour helps to conserve moisture.

The Yawdim soil is poorly suited to windbreaks. It is limited mainly by the very low available water capacity.

The main limitations for homesite development on the Delpoint soil are moderate depth to sedimentary beds, potential frost action, and low soil strength. The soil is severely limited for septic tank absorption fields because of slow permeability of the underlying beds. Frost action and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations.

The main limitations for homesite development on the Yawdim soil are slow permeability, shallow depth to shale, shrink-swell potential, potential frost action, and low soil strength. The Yawdim soil is severely limited for septic tank absorption fields because of the slow permeability and the shallow depth to shale. Cuts to level building sites can expose shale. Shrinking and swelling, frost action, and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential.

This map unit is in capability subclass IVe, nonirrigated. The Delpoint soil is in Silty range site, 10- to 14-inch precipitation zone, and the Yawdim soil is in Shallow range site, 10- to 14-inch precipitation zone.

63—Dilts-Julin clays, 4 to 15 percent slopes. This map unit is on uplands in the east-central and northeastern parts of the county. Slopes commonly are 250 to 1,000 feet long. Elevation is 2,200 to 3,800 feet.

The average annual precipitation is about 12 inches, the average annual air temperature is about 44 degrees F, and the average frost-free period is about 130 days.

This unit is about 50 percent Dilts clay and 30 percent Julin clay. The Dilts soil is mainly on the tops of ridges and knolls, and the Julin soil is on side slopes of ridges and knolls.

Included in this unit are small areas of deep Teigen and Vanda soils on foot slopes and fans and moderately deep Thebo soils on plane and convex side slopes. Also included are small areas of shale Rock outcrop. The Vanda soils have a crusty surface layer and are salt- and alkali-affected. Included areas make up about 20 percent of the total acreage.

The Dilts soil is shallow and well drained. It formed in residuum derived dominantly from consolidated shale. Typically, the surface layer is light brownish gray clay about 3 inches thick. The underlying material is light brownish gray and grayish brown clay about 12 inches thick. Gray consolidated shale is at a depth of about 15 inches. Depth to shale ranges from 10 to 20 inches.

Permeability of the Dilts soil is very slow. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. The average annual wetting depth where this soil is under native vegetation is 10 to 15 inches. Runoff is medium to rapid, and the hazard of water erosion is moderate. The hazard of soil blowing is high.

The Julin soil is moderately deep and well drained. It formed in residuum derived dominantly from consolidated shale. Typically, the surface layer is gray clay about 7 inches thick. The underlying material is gray silty clay about 23 inches thick. Gray consolidated shale is at a depth of about 30 inches. Depth to shale ranges from 20 to 40 inches.

Permeability of the Julin soil is slow. Available water capacity is very low to low. Effective rooting depth is 20 to 40 inches. The average annual wetting depth where this soil is under native vegetation is 20 to 22 inches. Runoff is medium to rapid, and the hazard of water erosion is moderate. The hazard of soil blowing is high.

The soils in this unit are used as rangeland.

These soils are poorly suited to cultivated crops and to hay and pasture because of the very low and low available water capacity, the hazards of soil blowing and water erosion, and the shallow and moderate depth to shale.

The potential plant community on the Dilts soil is mainly western wheatgrass, prairie sandreed, thickspike wheatgrass, and plains reedgrass. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of plains reedgrass, prairie junegrass, longleaf sagebrush, and creeping juniper increases. If excessive grazing continues, plants such as goldenpea, creeping juniper, perennial weeds, and annuals may invade. The potential plant community produces about 700 pounds of air-dry vegetation in years of above-normal precipitation and 300 pounds in years of below-normal precipitation.

The potential plant community on the Julin soil is mainly western wheatgrass, thickspike wheatgrass, prairie sandreed, and wildrose. If the range is excessively grazed, the proportion of these plants decreases and the proportion of plains reedgrass, goldenrod, longleaf sagebrush, and big sagebrush increases. If excessive grazing continues, plants such as goldenpea, annuals, perennial weeds, and creeping juniper may invade. The potential plant community produces about 900 pounds of air-dry vegetation in years of above-normal precipitation and 400 pounds in years of below-normal precipitation.

These soils are suitable for seeding to adapted grasses and forbs if the range is in poor condition. Seedbed preparation and planting on the contour or across the slope, where practical, conserve moisture and help to control water erosion. The surface layer is susceptible to water erosion and soil blowing if it is disturbed or if the range is overgrazed.

These soils are poorly suited to windbreaks. They are limited mainly by the very low available water capacity.

The main limitations for homesite development on the soils in this unit are the very slow and slow permeability, shallow and moderate depth to shale, shrink-swell potential, and low soil strength. The soils are severely limited for septic tank absorption fields because of the very slow and slow permeability and the shallow and moderate depth to shale. Shrinking and swelling and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential.

This map unit is in capability subclass VIs, nonirrigated. The Dilts soil is in Shallow Clay range site, 10- to 14-inch precipitation zone, and the Julin soil is in Clayey range site, 10- to 14-inch precipitation zone.

64—Dilts-Julin-Rock outcrop complex, 15 to 60 percent slopes. This map unit is on uplands in the east-central and northeastern parts of the county. Slopes commonly are less than 250 feet long. Elevation is 2,200 to 3,800 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 44 degrees F, and the average frost-free period is about 130 days.

This unit is about 40 percent Dilts clay, 20 percent Julin clay, and 20 percent Rock outcrop. The Dilts soil is on ridges and has slopes of 15 to 50 percent. The Julin soil is on convex side slopes below areas of the Dilts soil and has slopes of 15 to 25 percent. Rock outcrop is on steep and very steep side slopes and ridge crests.

Included in this unit are small areas of moderately deep Thebo soils and shallow Neldore soils on uplands

and small areas of deep Marvan and Vanda soils on fans. The Marvan and Vanda soils are salt- and alkali-affected. The Vanda soils have a crusty surface layer. Included areas make up about 20 percent of the total acreage.

The Dilts soil is shallow and well drained. It formed in residuum derived dominantly from consolidated shale. Typically, the surface layer is light brownish gray clay about 3 inches thick. The underlying material is light brownish gray and grayish brown clay about 12 inches thick. Gray consolidated shale is at a depth of about 15 inches. Depth to shale ranges from 10 to 20 inches.

Permeability of the Dilts soil is very slow. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. The average annual wetting depth where this soil is under native vegetation is 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is high.

The Julin soil is moderately deep and well drained. It formed in residuum derived dominantly from consolidated shale. Typically, the surface layer is gray clay about 7 inches thick. The underlying material is gray silty clay about 23 inches thick. Gray consolidated shale is at a depth of about 30 inches. Depth to shale ranges from 20 to 40 inches.

Permeability of the Julin soil is slow. Available water capacity is very low to low. Effective rooting depth is 20 to 40 inches. The average annual wetting depth where this soil is under native vegetation is 20 to 22 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is high.

Rock outcrop consists of exposures of platy shale. It is on steep and very steep side slopes.

Most areas of this unit are used as range. A few areas are used as woodland.

The soils in this unit are poorly suited to cultivated crops and to hay and pasture because of steepness of slope and rough topography.

These soils are forested. They are poorly suited to livestock grazing. The potential native understory vegetation on the Dilts soil is dominated by Rocky Mountain juniper, bluebunch wheatgrass, prairie sandreed, and common chokecherry. The understory provides limited amounts of forage for livestock.

The potential native understory vegetation on the Julin soil is dominated by prairie sandreed, Rocky Mountain juniper, rose, rubber rabbitbrush, and western wheatgrass. The understory provides limited amounts of forage for livestock. Slopes of 30 to 50 percent adversely affect the distribution and management of livestock.

The Dilts and Julin soils are suited to the production of ponderosa pine and Douglas-fir. The site index is about 40 for ponderosa pine and 30 for Douglas-fir. At the culmination of the mean annual increment (CMAI), these soils can produce about 30 cubic feet, or 60 board feet, of ponderosa pine and 40 cubic feet, or 100 board feet (Scribner rule), of Douglas-fir per acre per year. Potential production is estimated for an even-aged, fully stocked stand of trees.

Seedling mortality is severe, plant competition is severe, and the hazard of windthrow is moderate. Where slopes are 15 to 25 percent, the hazard of erosion and equipment limitations are moderate. Where slopes are 25 to 50 percent, the hazard of erosion and equipment limitations are severe.

The main limitations of the Dilts and Julin soils for management of timber are permeability, steepness of slope, soil texture, shallow and moderate depth to shale, and low soil strength. Slopes of 25 to 50 percent restrict the kind of equipment that can be used and make its operation difficult. The clay and silty clay texture of the surface layer also limits the use of equipment.

Low strength of the soil material when wet and steepness of slope adversely affect the performance of roads and the stability of the landscape. Adequate drainage, gentle road grades, and surfacing minimize erosion. To minimize failure of roadfill and mass movement of the soil, roads should be constructed on mid or upper parts of slopes in areas that have favorable dips in the bedrock and gentle terrain.

The soils have low strength when wet, which results in poor trafficability and in soil compaction if heavy equipment is used to yard logs. Operating equipment when the soil is dry or frozen overcomes this limitation.

Establishment of vegetation on exposed shale is difficult. Where possible, removal of the soil material should be avoided or soil material should be added to cover exposed shale in areas to be seeded. Maintaining adequate plant cover in disturbed areas and using sediment filter strips of undisturbed vegetation along streams minimize soil erosion and the problems of water quality.

These soils are poorly suited to homesite development because of the steepness of slope, the shallow depth to shale in the Dilts soil, and the moderate depth to shale in the Julin soil.

This map unit is in capability subclass VIIe, nonirrigated. The Dilts soil is in woodland suitability group 7d4 where slopes are 15 to 25 percent and group 7d6 where slopes are 25 to 60 percent. The Julin soil is in woodland suitability group 7c4 where slopes are 15 to 25 percent and group 7c6 where slopes are 25 to 60 percent.

65—Dilts-Thebo-Neldore clays, 4 to 60 percent slopes. This map unit is on uplands in the east-central and northeastern parts of the county. Slopes commonly are 250 to 1,000 feet long. Elevation is 2,200 to 3,800 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 44 degrees F, and the average frost-free period is about 130 days.

This unit is about 40 percent Dilts clay, 30 percent Thebo clay, and 20 percent Neldore clay. The Dilts and Neldore soils are on ridges and sides of hills, and the Thebo soil is in concave areas. The Dilts soil has slopes of 4 to 50 percent, the Neldore soil has slopes of 4 to 60 percent, and the Thebo soil has slopes of 4 to 45 percent.

Included in this unit is about 5 percent deep Marvan soils, on fans, that are salt- and alkali-affected and about 5 percent shale Rock outcrop.

The Dilts soil is shallow and well drained. It formed in residuum derived dominantly from consolidated shale. Typically, the surface layer is light brownish gray clay about 3 inches thick. The underlying material is light brownish gray and grayish brown clay about 12 inches thick. Gray consolidated shale is at a depth of about 15 inches. Depth to shale ranges from 10 to 20 inches.

Permeability of the Dilts soil is very slow. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. The average annual wetting depth where this soil is under native vegetation is 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is high.

The Thebo soil is moderately deep and well drained. It formed in residuum derived dominantly from semiconsolidated shale. Typically, the surface layer is grayish brown clay about 5 inches thick. The underlying material is grayish brown clay about 28 inches thick. Gray semiconsolidated shale is at a depth of about 33 inches. Depth to shale ranges from 20 to 40 inches.

Permeability of the Thebo soil is very slow. Available water capacity is low to moderate. Effective rooting depth is 20 to 40 inches. The average annual wetting depth where this soil is under native vegetation is about 20 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is high.

The Neldore soil is shallow and well drained. It formed in residuum derived dominantly from consolidated shale. Typically, the surface layer is grayish brown clay about 3 inches thick. The upper 9 inches of the underlying material is grayish brown clay, and the lower 6 inches is light gray clay. Gray consolidated shale is at a depth of about 18 inches. Depth to shale ranges from 10 to 20 inches.

Permeability of the Neldore soil is slow. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. The average annual wetting depth where this soil is under native vegetation is 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is high.

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

The soils in this unit are poorly suited to cultivated crops and hay and pasture because of steepness of slope and rough topography.

The potential plant community on the Thebo soil is mainly western wheatgrass, green needlegrass, bluebunch wheatgrass, and thickspike wheatgrass. If the range is excessively grazed, the proportion of these plants decreases and the proportion of plains reedgrass, Sandberg bluegrass, prairie junegrass, and big sagebrush increases. If excessive grazing continues, plants such as perennial weeds, broom snakeweed, curlycup gumweed, and annual bromes may invade. The potential plant community produces about 1,400 pounds of air-dry vegetation in years of above-normal precipitation and 800 pounds in years of below-normal precipitation.

The Dilts and Neldore soils are forested. They are poorly suited to livestock grazing. The potential native understory vegetation on the Dilts soil is dominated by Rocky Mountain juniper, bluebunch wheatgrass, prairie sandreed, and common chokecherry. The understory provides limited amounts of forage for livestock.

The potential native understory vegetation on the Neldore soil is dominated by western wheatgrass, Rocky Mountain juniper, green needlegrass, prairie sandreed, bluebunch wheatgrass, creeping juniper, and common chokecherry. The understory provides limited amounts of forage for livestock. Slopes of 30 to 60 percent adversely affect the distribution and management of livestock.

The Dilts and Neldore soils are suited to the production of ponderosa pine and Douglas-fir. The site index is about 40 for ponderosa pine and 30 for Douglas-fir. At the culmination of the mean annual increment (CMAI), the Dilts and Neldore soils can produce about 30 cubic feet, or 60 board feet, of ponderosa pine and 40 cubic feet, or 100 board feet (Scribner rule), of Douglas-fir per acre per year. Potential production is estimated for an even-aged, fully stocked stand of trees.

Seedling mortality is severe, plant competition is severe, and the hazard of windthrow is moderate. Where slopes are 4 to 15 percent, the hazard of erosion and equipment limitations are slight. Where slopes are 15 to 25 percent, the hazard of erosion and equipment limitations are moderate. The hazard of erosion is severe and the use of equipment is severely limited where slopes are 25 percent or more.

The main limitations of the Dilts and Neldore soils for management of timber are permeability, steepness of slope, soil texture, shallow depth to shale, and low soil strength. Slopes of 25 to 60 percent restrict the kind of equipment that can be used and make its operation difficult. The clay texture of the surface layer also limits the use of equipment. Low strength of the soil material when wet and steepness of slope adversely affect the performance of roads and the stability of the landscape. Adequate drainage, gentle road grades, and surfacing minimize erosion. To minimize failure of roadfill and mass movement of the soils, roads should be constructed on mid or upper parts of slopes in areas that have favorable dips in the shale and gentle terrain.

The soils have low strength when wet, which results in poor trafficability and in soil compaction if heavy equipment is used to yard logs. Operating equipment when the soil is dry or frozen overcomes this limitation.

Establishment of vegetation on exposed shale is difficult. Where possible, removal of the soil should be avoided or soil material should be added to cover exposed shale in areas to be seeded. Where slopes are 15 to 60 percent, maintaining adequate plant cover in the disturbed areas and using sediment filter strips of undisturbed vegetation along streams minimize soil erosion and problems of water quality.

The soils in this unit are poorly suited to homesite development. They are limited by slope, shrink-swell potential, low soil strength, and the shallow and moderate depth to shale.

This map unit is in capability subclass VIIe, nonirrigated. The Thebo soil is in the Clayey range site, 10- to 14-inch precipitation zone. The Dilts and Neldore soils are in woodland suitability group 7d4 where slopes are 4 to 25 percent and group 7d6 where slopes are 25 to 60 percent.

66—Dilts-Welter-Julin complex, 4 to 25 percent slopes. This map unit is on uplands in the east-central and northeastern parts of the county. Slopes commonly are 250 to 1,000 feet long. Elevation is 2,200 to 3,800 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 44 degrees F, and the average frost-free period is about 130 days.

This unit is about 35 percent Dilts clay, 25 percent Welter silty clay loam, and 20 percent Julin clay. The Dilts soil is on hilltops and ridges, the Welter soil is in concave areas, and the Julin soil is in plane areas.

Included in this unit are small areas of deep Marvan and Teigen soils on fans and small areas of shale Rock outcrop. The Marvan soils are salt-and alkali-affected. Included areas make up about 20 percent of the total acreage.

The Dilts soil is shallow and well drained. It formed in residuum derived dominantly from consolidated shale. Typically, the surface layer is light brownish gray clay about 3 inches thick. The underlying material is light brownish gray and grayish brown clay about 12 inches thick. Gray consolidated shale is at a depth of about 15 inches. Depth to shale ranges from 10 to 20 inches.

Permeability of the Dilts soil is very slow. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. The average annual wetting depth where this soil is under native vegetation is 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is high.

The Welter soil is moderately deep and well drained. It formed in residuum and colluvium derived dominantly from consolidated shale. Typically, the surface is covered by a mat of pine cones, needles, twigs, and humus about 1 inch thick. The surface layer is light brownish gray silty clay loam about 4 inches thick. The subsoil is grayish brown silty clay about 20 inches thick. Light brownish gray consolidated shale is at a depth of about 24 inches. Depth to shale ranges from 20 to 40 inches.

Permeability of the Welter soil is slow. Available water capacity is very low to low. Effective rooting depth is 20 to 40 inches. The average annual wetting depth where this soil is under native vegetation is 20 to 22 inches. Runoff is medium to rapid, and the hazard of water erosion is moderate to high. The hazard of soil blowing is high.

The Julin soil is moderately deep and well drained. It formed in residuum derived dominantly from consolidated shale. Typically, the surface layer is gray clay about 7 inches thick. The underlying material is gray silty clay about 23 inches thick. Gray consolidated shale is at a depth of about 30 inches. Depth to shale ranges from 20 to 40 inches.

Permeability of the Julin soil is slow. Available water capacity is very low to low. Effective rooting depth is 20 to 40 inches. The average annual wetting depth where this soil is under native vegetation is 20 to 22 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is high.

Most areas of this unit are used as range. A few areas are used as woodland.

The soils in this unit are poorly suited to cultivated crops and to hay and pasture because of the low and very low available water capacity, the hazards of soil blowing and water erosion, slope, and the shallow and moderate depth to shale.

The potential plant community on the Julin soil is mainly western wheatgrass, thickspike wheatgrass, prairie sandreed, and wild rose. If the range is excessively grazed, the proportion of these plants decreases and the proportion of plains reedgrass, goldenrod, longleaf sagebrush, and big sagebrush increases. If excessive grazing continues, plants such as goldenpea, annuals, perennial weeds, and creeping juniper may invade. The potential plant community produces about 900 pounds of air-dry vegetation in years of above-normal precipitation and 400 pounds in years of below-normal precipitation.

The Dilts and Welter soils and about half of the acreage of the Julin soil are forested. They are suited to livestock grazing. The potential native understory vegetation on the Dilts soil is dominated by Rocky Mountain juniper, bluebunch wheatgrass, prairie sandreed, and common chokecherry. The understory provides limited amounts of forage for livestock.

The potential native understory vegetation on the forested part of the Julin soil is dominated by prairie sandreed, Rocky Mountain juniper, rose, rubber rabbitbrush, and western wheatgrass. The understory provides limited amounts of forage for livestock.

The Dilts and Julin soils are suited to the production of ponderosa pine and Douglas-fir. The site index is about 40 for ponderosa pine and 30 for Douglas-fir. At the culmination of the mean annual increment (CMAI), the Dilts and Julin soils can produce 30 cubic feet, or 60 board feet, of ponderosa pine and 40 cubic feet, or 100 board feet (Scribner rule), of Douglas-fir per acre per year. Potential production is estimated for an even-aged, fully stocked stand of trees.

Seedling mortality is severe, plant competition is severe, and the hazard of windthrow is moderate. Where slopes are 4 to 15 percent, the hazard of erosion and equipment limitations are slight. Where slopes are 15 to 25 percent, the hazard of erosion and equipment limitations are moderate.

The potential native understory vegetation on the Welter soil is dominated by pinegrass, Rocky Mountain juniper, common juniper, horizontal juniper, bluebunch wheatgrass, western wheatgrass, and Oregon-grape. The understory provides limited amounts of forage for livestock.

The Welter soil is suited to the production of ponderosa pine and Douglas-fir. The site index is about 55 for ponderosa pine and 32 for Douglas-fir. At the culmination of the mean annual increment (CMAI), the Welter soil can produce about 40 cubic feet, or 110 board feet, of ponderosa pine and 40 cubic feet, or 110 board feet (Scribner rule), of Douglas-fir per acre per year. Potential production is estimated for an even-aged, fully stocked stand of trees.

Seedling mortality is moderate, plant competition is moderate, and the hazard of windthrow is slight. Where slopes are 4 to 15 percent, the hazard of erosion and equipment limitations are slight. Where slopes are 25 to 25 percent, the hazard of erosion and equipment limitations are moderate.

The main limitations of the Dilts, Welter, and Julin soils for management of timber are permeability, steepness of slope, soil texture, shallow and moderate depth to shale, and low soil strength. Slopes of 15 to 25 percent restrict the kind of equipment that can be used and make its operation difficult. The silty clay loam and clay texture of the surface layer limits the use of equipment. The soil has low strength when wet, which results in poor trafficability and in soil compaction if heavy equipment is used to yard logs. Operating equipment when the soil is dry or frozen overcomes these limitations.

Low strength of the soil material when wet and steepness of slope adversely affect the performance of roads and the stability of the landscape. Adequate drainage, gentle road grades, and surfacing minimize erosion. To minimize failure of roadfill and mass movement of the soil, roads should be constructed on mid or upper parts of slopes in areas that have favorable dips in the shale and gentle terrain.

Establishment of vegetation on exposed shale is difficult. Where feasible, removal of the soil material should be avoided or soil material should be added to cover exposed shale in areas to be seeded. Where slopes are 15 to 25 percent, maintaining adequate plant cover in disturbed areas and using sediment filter strips of undisturbed vegetation along streams minimize soil erosion and problems of water quality.

The main limitations for homesite development on the soils in this unit are the very slow and slow permeability, shallow and moderate depth to shale, shrink-swell potential, and low soil strength. These soils are severely limited for septic tank absorption fields because of the very slow and slow permeability and shallow and moderate depth to shale. Cuts to level building sites can expose shale. Shrinking and swelling and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential.

This map unit is in capability subclass VIe, nonirrigated. The grassland areas of the Julin soil are in Clayey range site, 10- to 14-inch precipitation zone. The Dilts and Julin soils are in woodland suitability group 7d2 where slopes are 4 to 15 percent and group 7d4 where slopes are 15 to 25 percent. The Welter soil is in woodland suitability group 6c2 where slopes are 4 to 15 percent and group 6c4 where slopes are 15 to 25 percent.

67—Doney-Wayden complex, 15 to 60 percent slopes. This map unit is on uplands in the central and western parts of the county. Slopes commonly are 250 to 1,000 feet long. Elevation is 3,400 to 4,200 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 120 days.

This unit is about 40 percent Doney loam and 25 percent Wayden silty clay loam. The Doney soil is in plane areas and has slopes of 15 to 60 percent. The Wayden soil is on ridges and has slopes of 15 to 50 percent.

Included in this unit are areas of shallow Cabba and Rentsac soils, deep Winifred soils, and Rock outcrop. Included areas make up about 35 percent of the total acreage.

The Doney soil is moderately deep and well drained. It formed in residuum derived dominantly from weakly consolidated, sandy and silty sedimentary beds. Typically, the surface layer is light brownish gray loam about 4 inches thick. The subsoil is very pale brown loam about 10 inches thick. The substratum is very pale brown loam about 11 inches thick. Pale yellow, weakly consolidated, sandy and silty sedimentary beds are at a depth of about 25 inches. Depth to sedimentary beds ranges from 20 to 40 inches.

Permeability of the Doney soil is moderate. Available water capacity is low. Effective rooting depth is 20 to 40 inches. The average annual wetting depth where this soil is under native vegetation is 20 to 30 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is high.

The Wayden soil is shallow and well drained. It formed in residuum derived dominantly from semiconsolidated shale. Typically, the surface layer is light brownish gray silty clay loam about 6 inches thick. The underlying material is light brownish gray silty clay loam and silty clay 10 inches thick. Light gray semiconsolidated shale is at a depth of about 16 inches. Depth to shale ranges from 10 to 20 inches.

Permeability of the Wayden soil is slow. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. The average annual wetting depth where this soil is under native vegetation is 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is high.

The soils in this unit are used as rangeland.

These soils are poorly suited to cultivated crops and to hay and pasture because of steepness of slope and rough topography.

The potential plant community on the Doney soil is mainly bluebunch wheatgrass, green needlegrass, western wheatgrass, and little bluestem. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of western wheatgrass, needleandthread, blue grama, and Sandberg bluegrass increases. If excessive grazing continues, plants such as Kentucky bluegrass, timothy, perennial weeds, and red threeawn may invade. The potential plant community produces about 1,500 pounds of air-dry vegetation in years of above-normal precipitation and 900 pounds in years of below-normal precipitation.

The potential plant community on the Wayden soil is mainly western wheatgrass, bluebunch wheatgrass, green needlegrass, and plains muhly. If the range is excessively grazed, the proportion of these plants decreases and the proportion of blue grama, prairie junegrass, needleandthread, and fringed sagewort increases. If excessive grazing continues, plants such as Kentucky bluegrass, clubmoss, perennial weeds, and annuals may invade. The potential plant community produces about 900 pounds of air-dry vegetation in years of above-normal precipitation and 400 pounds in years of below-normal precipitation.

Steepness of slope limits access of livestock and promotes overgrazing of the less sloping areas. The surface layer is susceptible to water erosion and soil blowing if it is disturbed or the range is overgrazed. These soils are not suited to mechanical treatment because of slope and rough topography.

These soils are poorly suited to windbreaks. They are limited mainly by slope.

This unit is poorly suited to homesite development because of steepness of slope, moderate depth to sedimentary beds in the Doney soil, and shallow depth to shale in the Wayden soil.

This map unit is in capability subclass VIIe, nonirrigated. The Doney soil is in Silty range site, 15- to 19-inch precipitation zone, and the Wayden soil is in Shallow range site, 15- to 19-inch precipitation zone.

68—Doney-Windham complex, 8 to 15 percent slopes. This map unit is on uplands in the western part of the county. Slopes commonly are 250 to 1,000 feet long. Elevation is 3,400 to 4,200 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 120 days.

This unit is about 60 percent Doney loam and 20 percent Windham gravelly loam. The Doney soil is on uplands below terraces, and the Windham soil is on strongly sloping terrace edges.

Included in this unit are small areas of shallow Cabba and Wayden soils on knolls, moderate deep Vebar soils on backslopes, and deep Shambo and Tally soils on foot slopes. Included areas make up about 20 percent of the total acreage.

The Doney soil is moderately deep and well drained. It formed in residuum derived dominantly from weakly consolidated, sandy and silty sedimentary beds. Typically, the surface layer is light brownish gray loam about 4 inches thick. The subsoil is very pale brown loam about 10 inches thick. The substratum is very pale brown loam about 11 inches thick. Pale yellow, weakly consolidated, sandy and silty sedimentary beds are at a depth of about 25 inches. Depth to sedimentary beds ranges from 20 to 40 inches.

Permeability of the Doney soil is moderate. Available water capacity is low. Effective rooting depth is 20 to 40 inches. The average annual wetting depth where this soil is under native vegetation is 20 to 30 inches. Runoff is medium, and the hazard of water erosion is high. The hazard of soil blowing is high.

The Windham soil is deep and well drained. It formed in alluvium derived dominantly from limestone. Typically, the surface layer is dark grayish brown gravelly loam about 6 inches thick. The subsoil is pale brown gravelly clay loam about 6 inches thick. The upper 6 inches of the substratum is white very gravelly loam, and the lower part to a depth of 60 inches or more is very pale brown extremely gravelly loam.

Permeability of the Windham soil is moderate to a depth of 18 inches and moderately rapid below this depth. Available water capacity is very low to low. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is about 30 inches. Runoff is medium, and the hazard of water erosion is high. The hazard of soil blowing is high.

The soils in this unit are used mainly as rangeland. They are also used for hay and pasture and for nonirrigated crops such as wheat, barley, and oats.

These soils are suited to nonirrigated crops. They are limited mainly by the low or very low available water capacity and the hazards of water erosion and soil blowing. Crops that are tolerant of drought are most suitable because the available moisture is not adequate for good growth of most other crops. Minimum tillage, contour cultivation, grassed waterways, stubble-mulch tillage, and growing sod crops such as hay and pasture help to control soil blowing and water erosion. Crops respond to nitrogen and phosphorus fertilizer.

The potential plant community on the Doney soil is mainly bluebunch wheatgrass, green needlegrass, western wheatgrass, and needleandthread. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of needleandthread, blue grama, western wheatgrass, and Sandberg bluegrass increases. If excessive grazing continues, plants such as Kentucky bluegrass, timothy, perennial weeds, and red threeawn may invade. The potential plant community produces about 1,500 pounds of air-dry vegetation in years of above-normal precipitation and 900 pounds in years of below-normal precipitation.

The potential plant community on the Windham soil is mainly bluebunch wheatgrass, western wheatgrass, green needlegrass, and needleandthread. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of needleandthread, blue grama, fringed sagewort, and wild rose increases. If excessive grazing continues, plants such as broom snakeweed, clubmoss, perennial weeds, and annuals may invade. The potential plant community produces about 1,400 pounds of air-dry vegetation in years of above-normal precipitation and 700 pounds in years of below-normal precipitation.

These soils are suitable for seeding to adapted grasses and forbs if the range is in poor condition. Seedbed preparation and planting on the contour or across the slope, where practical, conserve moisture and help to control water erosion. The surface layer is susceptible to water erosion and soil blowing if it is disturbed or if the range is overgrazed.

The Doney soil is suited to windbreaks, but the low available water capacity of the soil limits the growth of both trees and shrubs. Suitable trees for planting are Russian-olive, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, western sandcherry, and skunkbush sumac.

The Windham soil is suited to windbreaks, but the high concentration of lime at a depth of less than 15 inches and the limited moisture supply restrict the choice of trees and shrubs. Suitable trees for planting are Russian-olive, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, and skunkbush sumac.

Summer fallow, cultivation for weed control, and selection of adapted plants are needed to insure establishment and survival of seedlings on these soils. Planting on the contour helps to conserve moisture.

The main limitations for homesite development on the Doney soil are moderate depth to sedimentary beds, potential frost action, and low soil strength. If the soil is used for septic tank absorption fields, the slow permeability of the underlying sedimentary beds can be overcome by increasing the size of the absorption field or by excavating the trench to a suitable depth. The field or trench should be backfilled with gravel. Frost action and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations.

The Windham soil has few limitations for homesite development. Slope is a concern in installing septic tank absorption fields. Absorption lines should be installed on the contour. Removal of pebbles and cobbles in disturbed areas is needed for best results when landscaping, particularly in areas used for lawns.

This map unit is in capability subclass IVe, nonirrigated. The Doney soil is in Silty range site, 15- to 19-inch precipitation zone, and the Windham soil is in Limy range site, 15- to 19-inch precipitation zone.

69—Doney-Windham complex, 15 to 45 percent slopes. This map unit is on uplands in the western part of the county. Slopes commonly are 250 to 1,000 feet long. Elevation is 3,400 to 4,200 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 120 days.

This unit is about 50 percent Doney loam and 30 percent Windham gravelly loam. The Doney soil is on uplands below terraces, and the Windham soil is on steeply sloping terrace edges.

Included in this unit are small areas of shallow Cabba and Wayden soils on ridges, moderately deep Vebar soils on backslopes, and deep Tally soils on foot slopes. Included areas make up about 20 percent of the total acreage.

The Doney soil is moderately deep and well drained. It formed in residuum derived dominantly from weakly consolidated, sandy and silty sedimentary beds. Typically, the surface layer is light brownish gray loam about 4 inches thick. The subsoil is very pale brown loam about 10 inches thick. The substratum is very pale brown loam about 11 inches thick. Pale yellow, weakly consolidated, sandy and silty sedimentary beds are at a depth of about 25 inches. Depth to sedimentary beds ranges from 20 to 40 inches.

Permeability of the Doney soil is moderate. Available water capacity is low. Effective rooting depth is 20 to 40 inches. The average annual wetting depth where this soil is under native vegetation is 20 to 30 inches. Runoff is

medium, and the hazard of water erosion is high. The hazard of soil blowing is high.

The Windham soil is deep and well drained. It formed in alluvium derived dominantly from limestone. Typically, the surface layer is dark grayish brown gravelly loam about 6 inches thick. The subsoil is pale brown gravelly clay loam about 6 inches thick. The upper 6 inches of the substratum is white very gravelly loam, and the lower part to a depth of 60 inches or more is very pale brown extremely gravelly loam.

Permeability of the Windham soil is moderate to a depth of 18 inches and moderately rapid below this depth. Available water capacity is very low to low. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is about 30 inches. Runoff is medium, and the hazard of water erosion is high. The hazard of soil blowing is high.

The soils in this unit are used as rangeland.

These soils are poorly suited to cultivated crops and to hay and pasture because of steepness of slope and rough topography.

The potential plant community on the Doney soil is mainly bluebunch wheatgrass, green needlegrass, western wheatgrass, and needleandthread. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of needleandthread, blue grama, western wheatgrass, and Sandberg bluegrass increases. If excessive grazing continues, plants such as Kentucky bluegrass, timothy, perennial weeds, and red threeawn may invade. The potential plant community produces about 1,500 pounds of air-dry vegetation in years of above-normal precipitation and 900 pounds in years of below-normal precipitation.

The potential plant community on the Windham soil is mainly bluebunch wheatgrass, western wheatgrass, green needlegrass, and needleandthread. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of needleandthread, blue grama, fringed sagewort, and wild rose increases. If excessive grazing continues, plants such as broom snakeweed, clubmoss, perennial weeds, and annuals may invade. The potential plant community produces about 1,400 pounds of air-dry vegetation in years of above-normal precipitation and 700 pounds in years of below-normal precipitation.

Steepness of slope limits access of livestock and promotes overgrazing of the less sloping areas. The surface layer is susceptible to water erosion and soil blowing if it is disturbed or if the range is overgrazed. These soils are not suited to mechanical treatment because of slope and rough topography.

These soils are poorly suited to windbreaks. They are limited mainly by slope.

The main limitations for homesite development on the Doney soil are slope, moderate depth to sedimentary beds, potential frost action, and low soil strength. The soil is severely limited for septic tank absorption fields because of slope and slow permeability of the underlying sedimentary beds. Frost action and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations.

The main limitations for homesite development on the Windham soil are slope and the content of rock fragments. Slope is a concern in installing septic tank absorption fields. Absorption lines should be installed on the contour. Removal of pebbles and cobbles in disturbed areas is needed for best results when landscaping, particularly in areas used for lawns.

This map unit is in capability subclass VIIe, nonirrigated. The Doney soil is in Silty range site, 15- to 19-inch precipitation zone, and the Windham soil is in Limy range site, 15- to 19-inch precipitation zone.

70—Doney-Winifred-Wayden complex, 15 to 45 percent slopes. This map unit is on uplands in the central and western parts of the county. Slopes commonly are 250 to 1,000 feet long. Elevation is 3,500 to 4,200 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 115 days.

This unit is about 35 percent Doney loam, 30 percent Winifred clay loam, and 20 percent Wayden silty clay loam. The Doney and Winifred soils are on plane and convex side slopes, and the Wayden soil is on ridges.

Included in this unit are small areas of moderately deep Amor soils and shallow Cabba soils. Included areas make up about 15 percent of the total acreage.

The Doney soil is moderately deep and well drained. It formed in residuum derived dominantly from weakly consolidated, sandy and silty sedimentary beds. Typically, the surface layer is light brownish gray loam about 4 inches thick. The subsoil is very pale brown loam about 10 inches thick. The substratum is very pale brown loam about 11 inches thick. Pale yellow, weakly consolidated, sandy and silty sedimentary beds are at a depth of about 25 inches. Depth to sedimentary beds ranges from 20 to 40 inches.

Permeability of the Doney soil is moderate. Available water capacity is low. Effective rooting depth is 20 to 40 inches. The average annual wetting depth where this soil is under native vegetation is 20 to 30 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is high.

The Winifred soil is moderately deep and well drained. It formed in alluvium and residuum derived dominantly from semiconsolidated shale. Typically, the surface layer is dark grayish brown clay loam about 6 inches thick. The upper 8 inches of the subsoil is grayish brown silty clay, the next 8 inches is grayish brown clay, and the lower part is grayish brown clay 10 inches thick. Light brownish gray and yellowish brown semiconsolidated

shale is at a depth of about 32 inches. Depth to shale ranges from 20 to 40 inches.

Permeability of the Winifred soil is slow. Available water capacity is low to moderate. Effective rooting depth is 20 to 40 inches. The average annual wetting depth where this soil is under native vegetation is about 26 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

The Wayden soil is shallow and well drained. It formed in residuum derived dominantly from semiconsolidated shale. Typically, the surface layer is light brownish gray silty clay loam about 6 inches thick. The substratum is light brownish gray silty clay loam and silty clay 10 inches thick. Light gray consolidated shale is at a depth of about 16 inches. Depth to shale ranges from 10 to 20 inches.

Permeability of the Wayden soil is slow. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. The average annual wetting depth where this soil is under native vegetation is 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is high.

The soils in this unit are used as rangeland.

These soils are poorly suited to cultivated crops and to hay and pasture because of steepness of slope and rough topography.

The potential plant community on the Doney soil is mainly bluebunch wheatgrass, green needlegrass, western wheatgrass, and little bluestem. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of western wheatgrass, needleandthread, blue grama, and Sandberg bluegrass increases. If excessive grazing continues, plants such as Kentucky bluegrass, timothy, perennial weeds, and red threeawn may invade. The potential plant community produces about 1,500 pounds of air-dry vegetation in years of above-normal precipitation and 900 pounds in years of below-normal precipitation.

The potential plant community on the Winifred soil is mainly Idaho fescue, bluebunch wheatgrass, green needlegrass, and western wheatgrass. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of Sandberg bluegrass, blue grama, Idaho fescue, and plains reedgrass increases. If excessive grazing continues, plants such as Kentucky bluegrass, annuals, perennial weeds, and broom snakeweed may invade. The potential plant community produces about 2,300 pounds of air-dry vegetation in years of above-normal precipitation and 1,700 pounds in years of below-normal precipitation.

The potential plant community on the Wayden soil is mainly western wheatgrass, bluebunch wheatgrass, green needlegrass, and plains muhly. If the range is excessively grazed, the proportion of these plants decreases and the proportion of blue grama, prairie junegrass, needleandthread, and fringed sagewort increases. If excessive grazing continues, plants such as Kentucky bluegrass, clubmoss, perennial weeds, and annuals may invade. The potential plant community produces about 900 pounds of air-dry vegetation in years of above-normal precipitation and 400 pounds in years of below-normal precipitation.

Steepness of slope limits access of livestock and promotes overgrazing of the less sloping areas. The surface layer is susceptible to water erosion and soil blowing if it is disturbed or if the range is overgrazed. These soils are not suited to mechanical treatment because of slope and rough topography.

These soils are poorly suited to windbreaks. They are limited mainly by slope.

The main limitations for homesite development on the Doney soil are slope, moderate depth to sedimentary beds, potential frost action, and low soil strength. The Doney soil is severely limited for septic tank absorption fields because of slope and the slow permeability of the underlying sedimentary beds. Frost action and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations.

The main limitations for homesite development on the Winifred and Wayden soils are slow permeability, slope, moderate and shallow depth to shale, shrink-swell potential, and low soil strength. These soils are severely limited for septic tank absorption fields because of the slow permeability, slope, and moderate and shallow depth to shale. Cuts to level building sites can expose shale. Shrinking and swelling and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential.

This map unit is in capability subclass VIIe, nonirrigated. The Doney soil is in Silty range site, 15- to 19-inch precipitation zone, the Winifred soil is in Clayey range site, 15- to 19-inch precipitation zone, and the Wayden soil is in Shallow range site, 15- to 19-inch precipitation zone.

71—Doughty-Ashuelot Variant complex, 0 to 4 percent slopes. This map unit is on terraces in the south-central part of the county. Slopes commonly are 250 to 1,000 feet long. Elevation is 4,000 to 4,500 feet. The average annual precipitation is about 17 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 110 days.

This unit is 60 percent Doughty loam and about 20 percent Ashuelot Variant gravelly loam.

Included in this unit are small areas of shallow Ashuelot Variant loam and deep Judith soils. Included areas make up about 20 percent of the total acreage.

The Doughty soil is deep and well drained. It formed in alluvium derived dominantly from limestone. Typically, the surface layer is dark grayish brown loam about 5 inches thick. The subsoil is brown and pale brown clay loam about 15 inches thick. The upper 12 inches of the substratum is very pale brown clay loam, the next 10 inches is very pale brown extremely gravelly loam, and the lower part to a depth of 66 inches or more is very pale brown extremely gravelly sandy clay loam.

Permeability of the Doughty soil is moderate to a depth of about 32 inches and moderately rapid below this depth. Available water capacity is moderate. Effective rooting depth is 66 inches or more. The average annual wetting depth where this soil is under native vegetation is 66 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

The Ashuelot Variant soil is shallow and well drained. It formed in alluvium derived dominantly from limestone. Typically, the surface layer is grayish brown gravelly loam about 4 inches thick. The next layer is grayish brown clay loam about 5 inches thick. The upper 6 inches of the underlying material is pale brown extremely gravelly clay loam, the next 9 inches is pale brown, lime-cemented rock fragments, and the lower part to a depth of 62 inches or more is very pale brown extremely gravelly loamy sand. The lime-cemented layer is at a depth of about 15 inches. Depth to the lime-cemented layer ranges from 15 to 20 inches.

Permeability of the Ashuelot Variant soil is moderate to the lime-cemented layer and very rapid below this layer. Available water capacity is very low. Effective rooting depth is 15 to 20 inches. The average annual wetting depth where this soil is under native vegetation is 15 to 20 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high.

The soils in this unit are used for nonirrigated crops, mainly wheat, barley, oats, alfalfa, and grass for hay and pasture. They are also used as rangeland.

These soils are suited to nonirrigated crops. They are limited mainly by the hazard of soil blowing and the very low available water capacity of the Ashuelot Variant soil. Suitable methods for controlling soil blowing are stripcropping, tall grass barriers, field windbreaks, minimum tillage, stubble-mulch tillage, and growing sod crops such as hay and pasture. Crops respond to nitrogen and phosphorus fertilizer.

The potential plant community on the Doughty soil is mainly bluebunch wheatgrass, green needlegrass, rough fescue, and western wheatgrass. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of Idaho fescue, needleandthread, western wheatgrass, and fringed sagewort increases. If excessive grazing continues, plants such as timothy, Kentucky bluegrass, and annuals may invade. The potential plant community produces about 2,200 pounds of air-dry vegetation in years of above-normal precipitation and 1,700 pounds in years of below-normal precipitation.

The potential plant community on the Ashuelot Variant soil is mainly bluebunch wheatgrass, plains muhly, and green needlegrass. If the range is excessively grazed, the proportion of these plants decreases and the proportion of Idaho fescue, needleandthread, prairie junegrass, and fringed sagewort increases. If excessive grazing continues, plants such as Kentucky bluegrass, clubmoss, and annuals may invade. The potential plant community produces about 1,200 pounds of air-dry vegetation in years of above-normal precipitation and 800 pounds in years of below-normal precipitation.

These soils are suitable for seeding to adapted grasses and forbs if the range is in poor condition. The surface layer is susceptible to soil blowing if it is disturbed or if the range is overgrazed.

The Doughty soil is suited to windbreaks, but the moderate available water capacity limits the growth of both trees and shrubs. Suitable trees for planting are Russian-olive, Siberian crabapple, green ash, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and cotoneaster. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings.

The Ashuelot Variant soil is poorly suited to windbreaks. It is limited mainly by the very low available water capacity.

The main limitations for homesite development on the Doughty soil are potential frost action and low soil strength. Frost action and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. The very gravelly or extremely gravelly material below a depth of 20 to 40 inches in the Doughty soil is good roadfill.

The main limitations for homesite development on the Ashuelot Variant soil are shallow depth to the lime-cemented layer and content of rock fragments. The lime-cemented layer is rippable and therefore is not a serious limitation for most engineering uses. Lawn grasses, shrubs, and trees that are not sensitive to lime-induced chlorosis are suitable for landscaping. An annual application of iron chelates reduces the chlorosis. Removal of pebbles and cobbles in disturbed areas is needed for best results when landscaping, particularly in areas used for lawns.

This map unit is in capability subclass IVe, nonirrigated. The Doughty soil is in Silty range site, 15- to 19-inch precipitation zone, and the Ashuelot Variant soil is in Shallow range site, 15- to 19-inch precipitation zone.

72—Doughty-Judith loams, 0 to 2 percent slopes. This map unit is on terraces in the south-central part of

the county. Slopes commonly are more than 1,000 feet long. Elevation is 4,000 to 4,700 feet. The average annual precipitation is about 19 inches, the average annual air temperature is about 42 degrees F, and the average frost-free period is about 100 days.

This unit is 60 percent Doughty loam and about 30 percent Judith loam. The Doughty soil is on plane side slopes, and the Judith soil is on slight rises.

Included in this unit is about 10 percent Windham soils.

The Doughty soil is deep and well drained. It formed in alluvium derived dominantly from limestone. Typically, the surface layer is dark grayish brown loam about 5 inches thick. The subsoil is brown and pale brown clay loam about 15 inches thick. The upper 12 inches of the substratum is very pale brown clay loam, the next 10 inches is very pale brown extremely gravelly loam, and the lower part to a depth of 66 inches or more is very pale brown extremely gravelly sandy clay loam.

Permeability of the Doughty soil is moderate to a depth of about 32 inches and moderately rapid below this depth. Available water capacity is moderate. Effective rooting depth is 66 inches or more. The average annual wetting depth where this soil is under native vegetation is 66 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

The Judith soil is deep and well drained. It formed in alluvium derived dominantly from limestone. Typically, the surface layer is dark grayish brown loam about 6 inches thick. The upper 11 inches of the subsoil is brown and very pale brown clay loam, and the lower 7 inches is white clay loam. The upper 22 inches of the substratum is very pale brown extremely gravelly loam, and the lower part to a depth of 66 inches or more is very pale brown extremely gravelly sandy clay loam.

Permeability of the Judith soil is moderate to a depth of about 24 inches and moderately rapid below this depth. Available water capacity is moderate. Effective rooting depth is 66 inches or more. The average annual wetting depth where this soil is under native vegetation is about 30 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high.

The soils in this unit are used for nonirrigated crops, mainly wheat, barley, oats, alfalfa, and grass for hay and pasture. They are also used as rangeland.

These soils are well suited to nonirrigated crops. They are limited mainly by the moderate available water capacity and the hazard of soil blowing. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, stubble-mulch tillage, help to control soil blowing. Crops respond to nitrogen and phosphorus fertilizer.

The potential plant community on these soils is mainly bluebunch wheatgrass, green needlegrass, rough fescue, and western wheatgrass. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of Idaho fescue, needleandthread, western wheatgrass, and blue grama increases. If excessive grazing continues, plants such as timothy, Kentucky bluegrass, clubmoss, and perennial weeds may invade. The potential plant community produces about 2,200 pounds of air-dry vegetation in years of above-normal precipitation and 1,700 pounds in years of below-normal precipitation.

These soils are suitable for seeding to adapted grasses and forbs if the range is in poor condition. The surface layer is susceptible to water erosion and soil blowing if it is disturbed or if the range is overgrazed.

The Doughty soil is suited to windbreaks, but the moderate available water capacity of the soil limits the growth of both trees and shrubs. Suitable trees for planting are Russian-olive, Siberian crabapple, green ash, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and cotoneaster.

The Judith soil is suited to windbreaks, but the high concentration of lime at a depth of less than 15 inches and the limited moisture supply restrict the choice of trees and shrubs. Suitable trees for planting are Russian-olive, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, and skunkbush sumac.

Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings on these soils.

The main limitations for homesite development on the soils in this unit are potential frost action and low soil strength. Frost action and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. The very gravelly or extremely gravelly material below a depth of 20 to 40 inches in these soils is good roadfill.

This map unit is in capability subclass IIIe, nonirrigated, and in Silty range site, 15- to 19-inch precipitation zone.

73—Doughty-Judith loams, 2 to 8 percent slopes. This map unit is on terraces and fans in the south-central part of the county. Slopes commonly are 250 to 1,000 feet long. Elevation is 4,000 to 4,700 feet. The average annual precipitation is about 19 inches, the average annual air temperature is about 42 degrees F, and the average frost-free period is about 100 days.

This unit is about 50 percent Doughty loam and 30 percent Judith loam. The Doughty soil is on plane side slopes, and the Judith soil is on convex side slopes.

Included in this unit are small areas of shallow Ashuelot Variant soils, deep Windham soils, and Judith gravelly loam. Included areas make up about 20 percent of the total acreage.

The Doughty soil is deep and well drained. It formed in alluvium derived dominantly from limestone. Typically, the surface layer is dark grayish brown loam about 5

inches thick. The subsoil is brown and pale brown clay loam about 15 inches thick. The upper 12 inches of the substratum is very pale brown clay loam, the next 10 inches is very pale brown extremely gravelly loam, and the lower part to a depth of 66 inches or more is very pale brown extremely gravelly sandy clay loam.

Permeability of the Doughty soil is moderate to a depth of 32 inches and moderately rapid below this depth. Available water capacity is moderate. Effective rooting depth is 66 inches or more. The average annual wetting depth where this soil is under native vegetation is 66 inches or more. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

The Judith soil is deep and well drained. It formed in alluvium derived dominantly from limestone. Typically, the surface layer is dark grayish brown loam about 6 inches thick. The upper 11 inches of the subsoil is brown and very pale brown clay loam, and the lower 7 inches is white clay loam. The upper 22 inches of the substratum is very pale brown extremely gravelly loam, and the lower part to a depth of 66 inches or more is very pale brown extremely gravelly sandy clay loam.

Permeability of the Judith soil is moderate to a depth of 24 inches and moderately rapid below this depth. Available water capacity is moderate. Effective rooting depth is 66 inches or more. The average annual wetting depth where this soil is under native vegetation is about 30 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high.

The soils in this unit are used for nonirrigated crops, mainly wheat, barley, oats, alfalfa, and grass for hay and pasture. They are also used as rangeland.

These soils are well suited to nonirrigated crops. They are limited mainly by the moderate available water capacity and the hazards of soil blowing and water erosion. Minimum tillage, contour cultivation, grassed waterways, stubble-mulch tillage, and growing sod crops such as hay and pasture help to control soil blowing and water erosion. Crops respond to nitrogen and phosphorus fertilizer.

The potential plant community on these soils is mainly bluebunch wheatgrass, green needlegrass, rough fescue, and western wheatgrass. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of Idaho fescue, needleandthread, western wheatgrass, and blue grama increases. If excessive grazing continues, plants such as timothy, Kentucky bluegrass, clubmoss, and perennial weeds may invade. The potential plant community produces about 2,200 pounds of air-dry vegetation in years of above-normal precipitation and 1,700 pounds in years of below-normal precipitation.

These soils are suitable for seeding to adapted grasses and forbs if the range is in poor condition. Seedbed preparation and planting on the contour or across the slope, where practical, conserve moisture and help to control water erosion. The surface layer is susceptible to water erosion and soil blowing if it is disturbed or if the range is overgrazed.

The Doughty soil is suited to windbreaks, but the moderate available water capacity of the soil limits the growth of both trees and shrubs. Suitable trees for planting are Russian-olive, Siberian crabapple, green ash, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and cotoneaster.

The Judith soil is suited to windbreaks, but the high concentration of lime at a depth of less than 15 inches and the limited moisture supply restrict the choice of trees and shrubs. Suitable trees for planting are Russian-olive, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, and skunkbush sumac.

Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings on these soils. Planting on the contour helps to conserve moisture.

The main limitations for homesite development on the soils in this unit are potential frost action and low soil strength. Frost action and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. The very gravelly or extremely gravelly material below a depth of 20 to 40 inches in these soils is a good source of roadfill.

This map unit is in capability subclass IIIe, nonirrigated, and in Silty range site, 15- to 19-inch precipitation zone.

74—Doughty-Judith cobbly loams, 2 to 4 percent slopes. This map unit is on terraces in the south-central part of the county. Slopes commonly are 250 to 1,000 feet long. Elevation is 4,000 to 4,700 feet. The average annual precipitation is about 19 inches, the average annual air temperature is about 42 degrees F, and the average frost-free period is about 100 days.

This unit is about 50 percent Doughty cobbly loam and 30 percent Judith cobbly loam. The Doughty soil is on plane side slopes, and the Judith soil is on convex side slopes.

Included in this unit are small areas of deep Windham soils and shallow Ashuelot Variant soils on ridge crests. Also included are small areas of Doughty and Judith gravelly loams. Included areas make up about 20 percent of the total acreage.

The Doughty soil is deep and well drained. It formed in alluvium derived dominantly from limestone. Typically, the surface layer is dark grayish brown cobbly loam about 5 inches thick. The subsoil is brown and pale brown clay loam about 15 inches thick. The upper 12 inches of the substratum is very pale brown clay loam, the next 10 inches is very pale brown extremely gravelly

loam, and the lower part to a depth of 66 inches or more is very pale brown extremely gravelly sandy clay loam.

Permeability of the Doughty soil is moderate to a depth of 32 inches and moderately rapid below this depth. Available water capacity is moderate. Effective rooting depth is 66 inches or more. The average annual wetting depth where this soil is under native vegetation is 66 inches or more. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

The Judith soil is deep and well drained. It formed in alluvium derived dominantly from limestone. Typically, the surface layer is dark grayish brown cobbly loam about 6 inches thick. The upper 11 inches of the subsoil is brown and very pale brown clay loam, and the lower 7 inches is white clay loam. The upper 22 inches of the substratum is very pale brown extremely gravelly loam, and the lower part to a depth of 66 inches or more is very pale brown extremely gravelly sandy clay loam.

Permeability of the Judith soil is moderate to a depth of 24 inches and moderately rapid below this depth. Available water capacity is moderate. Effective rooting depth is 66 inches or more. The average annual wetting depth where this soil is under native vegetation is about 30 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high.

The soils in this unit are used for nonirrigated crops, mainly wheat, barley, oats, alfalfa, and grass for hay and pasture. They are also used as rangeland.

These soils are well suited to nonirrigated crops. They are limited mainly by the moderate available water capacity, the presence of cobbles on the surface, and the hazards of soil blowing and water erosion. Minimum tillage, contour cultivation, grassed waterways, stubble-mulch tillage, and growing sod crops such as hay and pasture help to control soil blowing and water erosion. Crops respond to nitrogen and phosphorus fertilizer.

The potential plant community on these soils is mainly bluebunch wheatgrass, green needlegrass, rough fescue, and western wheatgrass. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of Idaho fescue, needleandthread, western wheatgrass, and blue grama increases. If excessive grazing continues, plants such as timothy, Kentucky bluegrass, clubmoss, and perennial weeds may invade. The potential plant community produces about 2,200 pounds of air-dry vegetation in years of above-normal precipitation and 1,700 pounds in years of below-normal precipitation.

These soils are suitable for seeding to adapted grasses and forbs if the range is in poor condition. Seedbed preparation and planting on the contour or across the slope, where practical, conserve moisture and help to control water erosion. The surface layer is susceptible to water erosion and soil blowing if it is disturbed or if the range is overgrazed.

The Doughty soil is suited to windbreaks, but the moderate available water capacity of the soil limits the growth of both trees and shrubs. Suitable trees for planting are Russian-olive, Siberian crabapple, green ash, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and cotoneaster.

The Judith soil is suited to windbreaks, but the high concentration of lime at a depth of less than 15 inches and the limited moisture supply restrict the choice of trees and shrubs. Suitable trees for planting are Russian-olive, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, and skunkbush sumac.

Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings on these soils.

The main limitations for homesite development on the soils in this unit are potential frost action, content of rock fragments, and low soil strength. Frost action and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. Removal of pebbles and cobbles is needed for best results when landscaping, particularly in areas used for lawns. The very gravelly or extremely gravelly material below a depth of 20 to 40 inches in these soils is good roadfill.

This map unit is in capability subclass IIIe, nonirrigated, and in Silty range site, 15- to 19-inch precipitation zone.

75—Doughty-Sipple loams, 0 to 2 percent slopes. This map unit is on terraces in the southwestern part of the county. Slopes commonly are more than 1,000 feet long. Elevation is 4,000 to 4,800 feet. The average annual precipitation is about 19 inches, the average annual air temperature is about 42 degrees F, and the average frost-free period is about 100 days.

This unit is about 60 percent Doughty loam and 30 percent Sipple loam.

Included in this unit is about 10 percent deep Judith soils on slight rises.

The Doughty soil is deep and well drained. It formed in alluvium derived dominantly from limestone. Typically, the surface layer is dark grayish brown loam about 5 inches thick. The subsoil is brown and pale brown clay loam about 15 inches thick. The upper 12 inches of the substratum is very pale brown clay loam, the next 10 inches is very pale brown extremely gravelly loam, and the lower part to a depth of 66 inches or more is very pale brown extremely gravelly sandy clay loam.

Permeability of the Doughty soil is moderate to a depth of 32 inches and moderately rapid below this depth. Available water capacity is moderate. Effective rooting depth is 66 inches or more. The average annual wetting depth where this soil is under native vegetation

is 66 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

The Sipple soil is deep and well drained. It formed in alluvium derived dominantly from limestone. Typically, the surface layer is dark grayish brown loam about 6 inches thick. The upper 7 inches of the subsoil is brown clay loam, the next 9 inches is pale brown loam, and the lower 12 inches is light gray clay loam. The upper 8 inches of the substratum is light gray and white clay loam, and the lower part to a depth of 66 inches or more is very pale brown very gravelly loam.

Permeability of the Sipple soil is moderately slow to a depth of 52 inches and moderately rapid below this depth. Available water capacity is high. Effective rooting depth is 66 inches or more. The average annual wetting depth where this soil is under native vegetation is 66 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

The soils in this unit are used for nonirrigated crops, mainly wheat, barley, oats, alfalfa, and grass for hay and pasture. They are also used as rangeland.

These soils are well suited to nonirrigated crops. They are limited mainly by the hazard of soil blowing. Soil blowing can be reduced by returning crop residue to the soil; using tall grass barriers, field windbreaks, stubble-mulch tillage, and stripcropping; practicing minimum tillage; and growing sod crops such as hay and pasture.

The potential plant community on these soils is mainly bluebunch wheatgrass, green needlegrass, rough fescue, and western wheatgrass. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of Idaho fescue, needleandthread, western wheatgrass, and blue grama increases. If excessive grazing continues, plants such as timothy, Kentucky bluegrass, clubmoss, and perennial weeds may invade. The potential plant community produces about 2,200 pounds of air-dry vegetation in years of above-normal precipitation and 1,700 pounds in years of below-normal precipitation.

These soils are suitable for seeding to adapted grasses and forbs if the range is in poor condition. The surface layer is susceptible to soil blowing if it is disturbed or if the range is overgrazed.

The Doughty soil is suited to windbreaks, but the moderate available water capacity of the soil limits the growth of both trees and shrubs. Suitable trees for planting are Russian-olive, Siberian crabapple, green ash, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and cotoneaster.

The Sipple soil is well suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian crabapple, green ash, Siberian elm, white willow, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and cotoneaster.

Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings on these soils.

The main limitations for homesite development on the Doughty soil are potential frost action and low soil strength. Frost action and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. The very gravelly or extremely gravelly material below a depth of 20 to 40 inches in the Doughty soil is good roadfill.

The main limitations for homesite development on the Sipple soil are moderately slow permeability, potential frost action, and low soil strength. If the soil is used for septic tank absorption fields, the moderately slow permeability can be overcome by increasing the size of the absorption field. Frost action and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations.

This map unit is in capability subclass IIIc, nonirrigated, and in Silty range site, 15- to 19-inch precipitation zone.

76—Dryadine flaggy silt loam, 2 to 25 percent slopes. This moderately deep, well drained soil is on mountaintops in the south-central part of the county. It formed in residuum derived dominantly from fractured hard limestone. Slopes commonly are 250 to 1,000 feet long. Elevation is 8,000 to 9,000 feet. The average annual precipitation is about 35 inches, the average annual air temperature is about 36 degrees F, and the average frost-free period is less than 60 days.

Included in this unit are small areas of shallow Sheege soils and Rock outcrop in convex areas. Also included are small areas of moderately deep Skaggs soils in plane to concave areas.

Typically, the surface of this Dryadine soil is covered by a mat of pine needles, twigs, cones, and partially weathered organic matter about 1 1/2 inches thick. The surface layer is very dark grayish brown flaggy silt loam about 2 1/2 inches thick. The next layer is pale brown extremely flaggy silt loam about 9 1/2 inches thick. The underlying material is very pale brown and pale brown extremely flaggy silt loam about 22 inches thick. Limestone is at a depth of about 34 inches. Depth to limestone ranges from 20 to 40 inches.

Permeability is moderate. Available water capacity is very low. Effective rooting depth is 20 to 40 inches. The average annual wetting depth where this soil is under native vegetation is 20 to 40 inches. Runoff is slow to medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

This soil is used mainly for wildlife habitat. It is also used as woodland.

This soil is poorly suited to cultivated crops and to hay and pasture because of large stones in the surface layer, the cold climate, and the high elevation.

This soil is forested. It is not suited to livestock grazing. Access is difficult, and the growing season is short. The liklihood of snowfall early in summer and late in summer also makes management of livestock grazing difficult. The potential native understory vegetation is dominated by camas, Engelmann aster, milkvetch, American bistort, needleleaf sedge, clematis, Ross sandwort, alpine daisy, thistle, alpine bluebells, and aster. The understory provides limited amounts of forage for livestock.

This soil is suited to the production of white spruce, subalpine fir, and limber pine. The site index is about 20 for white spruce and 10 for subalpine fir. At the culmination of the mean annual increment (CMAI), the Dryadine soil can produce less than 20 cubic feet, or less than 40 board feet, of white spruce and less than 20 cubic feet, or less than 40 board feet (Scribner rule), of subalpine fir per acre per year. Potential production is estimated for an even-aged, fully stocked stand of trees.

The hazard of erosion is severe, equipment limitations are slight, seedling mortality is severe, plant competition is moderate, and the hazard of windthrow is severe.

The main limitations of this soil for management of timber are depth to bedrock, the cold climate, and the difficulty of reestablishing vegetation. Trees commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

The main limitations for homesite development on this soil are the cold climate, strong winds, high elevation, and depth to bedrock.

This map unit is in capability subclass VIIe, nonirrigated. It is in woodland suitability group 7f9.

77—Dumps, Mine. This map unit is on mountainsides and foot slopes in the North Moccasin, South Moccasin, and Judith Mountains. The areas consist of piles of waste rock from ore mines.

This unit provides no forage for livestock or wildlife, but it provides some protection for wildlife.

This map unit is in capability class VIII.

78—Eltsac clay, 4 to 8 percent slopes. This moderately deep, well drained soil is on uplands in the central and western parts of the county. It formed in residuum derived from semiconsolidated shale. Slopes commonly are 250 to 1,000 feet long. Elevation is 3,500 to 4,500 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 120 days.

Included in this unit are small areas of shallow Norbert soils on ridges and knolls and deep Lawther soils on foot slopes.

Typically, the surface layer of this Eltsac soil is dark grayish brown clay about 4 inches thick. The upper 17 inches of the underlying material is grayish brown clay, the next 8 inches is grayish brown and gray clay, and the lower part is dark gray and yellowish brown clay and shale fragments about 9 inches thick. Dark gray shale is at a depth of about 38 inches. Depth to shale ranges from 20 to 40 inches.

Permeability is very slow. Available water capacity is very low to low. Effective rooting depth is 20 to 40 inches. The average annual wetting depth where this soil is under native vegetation is 20 to 24 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high.

This soil is used for nonirrigated crops, mainly wheat, barley, oats, alfalfa, and grass for hay and pasture. It is also used as rangeland.

This soil is suited to nonirrigated crops. It is limited mainly by the very low to low available water capacity, difficulty of cultivation, and the hazards of soil blowing and water erosion. Using minimum tillage, contour cultivation, stripcropping, tall grass barriers, and grassed waterways; returning crop residue to the soil; and growing sod crops such as hay and pasture help to control soil blowing and water erosion. Tall grass barriers also reduce evaporation and trap snow, which increases the amount of moisture in the soil. Returning crop residue to the soil also helps to maintain good soil tilth. Chiseling through stubble in fall on the contour or across the slope helps to control water erosion.

The potential plant community on this soil is mainly rough fescue, bluebunch wheatgrass, green needlegrass, and western wheatgrass. If the range is excessively grazed, the proportion of these plants decreases and the proportion of Idaho fescue, plains reedgrass, blue grama, and Sandberg bluegrass increases. If excessive grazing continues, plants such as timothy, clubmoss, perennial weeds, and annuals may invade. The potential plant community produces about 2,300 pounds of air-dry vegetation in years of above-normal precipitation and 1,800 pounds in years of below-normal precipitation.

This soil is suitable for seeding to adapted grasses and forbs if the range is in poor condition. Seedbed preparation and planting on the contour or across the slope, where practical, conserve moisture and help to control water erosion. The surface layer is susceptible to water erosion and soil blowing if it is disturbed or if the range is overgrazed.

This soil is suited to windbreaks, but the low to very low available water capacity limits the growth of both trees and shrubs. Suitable trees for planting are Russian-olive, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, western sandcherry, and skunkbush sumac. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of

seedlings. Planting on the contour helps to conserve moisture.

The main limitations for homesite development on this soil are very slow permeability, moderate depth to shale, shrink-swell potential, and low soil strength. The soil is severely limited for septic tank absorption fields because of the very slow permeability and moderate depth to shale. Cuts to level building sites can expose shale. Shrinking and swelling and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential.

This map unit is in capability subclass IIIe, nonirrigated, and in Clayey range site, 15- to 19-inch precipitation zone.

79—Eltsac-Lawther clays, 2 to 8 percent slopes. This map unit is on uplands in the western part of the county. Slopes commonly are 250 to 1,000 feet long. Elevation is 3,500 to 4,200 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 120 days.

This unit is about 50 percent Eltsac clay and 30 percent Lawther clay. The Eltsac soil is on convex side slopes, and the Lawther soil is on fans and foot slopes.

Included in this unit are small areas of moderately deep Winifred soils on upland side slopes and deep Gerber soils on fans. Also included are small areas of shallow Norbert soils on knolls. Included areas make up about 20 percent of the total acreage.

The Eltsac soil is moderately deep and well drained. It formed in residuum derived dominantly from semiconsolidated shale. Typically, the surface layer is dark grayish brown clay about 4 inches thick. The upper 17 inches of the underlying material is grayish brown clay, the next 8 inches is grayish brown and gray clay, and the lower 9 inches is dark gray and yellowish brown clay and shale fragments. Dark gray shale is at a depth of about 38 inches. Depth to shale ranges from 20 to 40 inches.

Permeability of the Eltsac soil is very slow. Available water capacity is very low to low. Effective rooting depth is 20 to 40 inches. The average annual wetting depth where this soil is under native vegetation is 20 to 24 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high.

The Lawther soil is deep and well drained. It formed in alluvium derived dominantly from shale. Typically, the surface layer is grayish brown clay about 6 inches thick. The subsoil is light grayish brown silty clay about 14 inches thick. The substratum to a depth of 64 inches or more is light grayish brown clay.

Permeability of the Lawther soil is slow. Available water capacity is high. Effective rooting depth is 64 inches or more. The average annual wetting depth where this soil is under native vegetation is about 26 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high.

The soils in this unit are used for nonirrigated crops, mainly wheat, barley, oats, alfalfa, and grass for hay and pasture. They are also used as rangeland.

These soils are well suited to nonirrigated crops. They are limited mainly by the low to very low available water capacity of the Eltsac soil and the hazards of soil blowing and water erosion. Using minimum tillage, contour cultivation, stripcropping, tall grass barriers, and grassed waterways; returning crop residue to the soil; and growing sod crops such as hay and pasture help to control soil blowing and water erosion. Tall grass barriers also reduce evaporation and trap snow, which increases the amount of moisture in the soil. Returning crop residue to the soil also helps to maintain good soil tilth. Chiseling through stubble in fall on the contour or across the slope helps to control water erosion.

The potential plant community on these soils is mainly western wheatgrass, bluebunch wheatgrass, green needlegrass, and basin wildrye. If the range is excessively grazed, the proportion of these plants decreases and the proportion of Sandberg bluegrass, plains reedgrass, Idaho fescue, and blue grama increases. If excessive grazing continues, plants such as Kentucky bluegrass, broom snakeweed, perennial weeds, and annuals may invade. The potential plant community produces about 2,000 pounds of air-dry vegetation in years of above-normal precipitation and 1,400 pounds in years of below-normal precipitation.

These soils are suitable for seeding to adapted grasses and forbs if the range is in poor condition. Seedbed preparation and planting on the contour or across the slope, where practical, conserve moisture and help to control water erosion. The surface layer is susceptible to water erosion and soil blowing if it is disturbed or if the range is overgrazed.

The Eltsac soil is suited to windbreaks, but the low to very low available water capacity limits the growth of both trees and shrubs. Suitable trees for planting are Russian-olive, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, western sandcherry, and skunkbush sumac.

The Lawther soil is well suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian crabapple, green ash, Siberian elm, white willow, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and cotoneaster.

Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings on these soils. Planting on the contour helps to conserve moisture.

The main limitations for homesite development on the soils in this unit are the very slow and slow permeability, shrink-swell potential, low soil strength, and moderate depth to shale in the Eltsac soil. The soils are severely limited for septic tank absorption fields because of the very slow and slow permeability and the moderate depth to shale in the Eltsac soil. Cuts to level building sites can expose shale. Shrinking and swelling and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential.

This map unit is in capability subclass IIIe, nonirrigated, and in Clayey range site, 15- to 19-inch precipitation zone.

80—Eltsac-Norbert clays, 8 to 25 percent slopes. This map unit is on uplands in the western part of the county. Slopes commonly are 250 to 1,000 feet long. Elevation is 3,500 to 4,500 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 120 days.

This unit is about 50 percent Eltsac clay and 45 percent Norbert clay. The Eltsac clay is on plane side slopes, and the Norbert soil is on ridges and knolls.

Included in this unit are small areas of deep Lawther soils on foot slopes and some small areas of shale Rock outcrop on ridge crests. Included areas make up about 5 percent of the total acreage.

The Eltsac soil is moderately deep and well drained. It formed in residuum derived dominantly from semiconsolidated shale. Typically, the surface layer is dark grayish brown clay about 4 inches thick. The upper 17 inches of the underlying material is grayish brown clay, the next 8 inches is grayish brown and gray clay, and the lower 9 inches is dark gray and yellowish brown clay and shale fragments. Dark gray shale is at a depth of about 38 inches. Depth to shale ranges from 20 to 40 inches.

Permeability of the Eltsac soil is very slow. Available water capacity is very low to low. Effective rooting depth is 20 to 40 inches. The average annual wetting depth where this soil is under native vegetation is 20 to 24 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is high.

The Norbert soil is shallow and well drained. It formed in residuum derived dominantly from semiconsolidated shale. Typically, the surface layer is olive gray clay about 3 inches thick. The upper 6 inches of the underlying material is olive gray clay, and the lower 5 inches is gray shaly clay. Gray shale is at a depth of about 14 inches. Depth to shale ranges from 10 to 20 inches.

Permeability of the Norbert soil is very slow. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. The average annual wetting depth where this soil is under native vegetation is 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is high.

The soils in this unit are used as rangeland.

These soils are poorly suited to cultivated crops and to hay and pasture because of the hazards of soil blowing and water erosion, the very low and low available water capacity, and the shallow and moderate depth to shale.

The potential plant community on the Eltsac soil is mainly rough fescue, bluebunch wheatgrass, green needlegrass, and western wheatgrass. If the range is excessively grazed, the proportion of these plants decreases and the proportion of Idaho fescue, plains reedgrass, blue grama, and Sandberg bluegrass increases. If excessive grazing continues, plants such as timothy, clubmoss, perennial weeds, and annuals may invade. The potential plant community produces about 2,300 pounds of air-dry vegetation in years of above-normal precipitation and 1,800 pounds in years of below-normal precipitation.

The potential plant community on the Norbert soil is mainly bluebunch wheatgrass, western wheatgrass, green needlegrass, and big sagebrush. If the range is excessively grazed, the proportion of these plants decreases and the proportion of plains reedgrass, Sandberg bluegrass, prairie junegrass, and fringed sagewort increases. If excessive grazing continues, plants such as broom snakeweed, pricklypear, perennial weeds, and annuals may invade. The potential plant community produces about 1,100 pounds of air-dry vegetation in years of above-normal precipitation and 600 pounds in years of below-normal precipitation.

These soils have a granular clay surface layer that is susceptible to water erosion and soil blowing if it is disturbed or if the range is overgrazed.

Where slopes are 8 to 15 percent, the Eltsac soil is suited to windbreaks; however, the low to very low available water capacity limits the growth of both trees and shrubs. Suitable trees for planting are Russian-olive, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, western sandcherry, and skunkbush sumac. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings. Planting on the contour helps to conserve moisture.

The Norbert soil and the Eltsac soil where slopes are 15 to 25 percent are poorly suited to windbreaks. They are limited mainly by slope and by the very low available water capacity of the Norbert soil.

The main limitations for homesite development on the soils in this unit are very slow permeability, moderate to shallow depth to shale, shrink-swell potential, and low soil strength. The soils are severely limited for septic

tank absorption fields because of the very slow permeability and moderate to shallow depth to shale. Cuts to level building sites can expose shale. Shrinking and swelling and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential.

This map unit is in capability subclass VIe, nonirrigated. The Eltsac soil is in Clayey range site, 15- to 19-inch precipitation zone, and the Norbert soil is in Shallow Clay range site, 15- to 19-inch precipitation zone.

81—Elve-Arcette complex, 15 to 60 percent slopes. This map unit is on ridgetops and mountainsides in the central part of the county. Slopes commonly are 250 to 1,000 feet long. Elevation is 5,000 to 6,500 feet. The average annual precipitation is about 22 inches, the average annual air temperature is about 40 degrees F, and the average frost-free period is about 70 days.

This unit is 65 percent Elve very cobbly loam and about 30 percent Arcette extremely gravelly loam. The Elve soil is on mountainsides, and the Arcette soil is on ridgetops and mountainsides.

Included in this unit are small areas of Rock outcrop and Rubble land. These areas make up about 5 percent of the total acreage.

The Elve soil is deep and somewhat excessively drained. It formed in colluvium and alluvium derived dominantly from igneous rock. Typically, the surface is covered with a mat of forest litter of undecomposed and decomposed needles, twigs, and cones about 1 inch thick. The surface layer is pale brown very cobbly loam about 2 inches thick. The subsurface layer is very pale brown very cobbly loam about 15 inches thick. The subsoil is light yellowish brown extremely cobbly loam about 16 inches thick. The substratum to a depth of 60 inches or more is yellow extremely cobbly sandy loam.

Permeability of the Elve soil is moderately rapid. Available water capacity is very low. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is 60 inches or more. Runoff is medium, and the hazard of water erosion is high. The hazard of soil blowing is slight.

The Arcette soil is deep and excessively drained. It formed in residuum derived dominantly from igneous rock. Typically, the surface is covered by a mat of decomposed and undecomposed organic matter of pine needles, cones, and twigs about 2 inches thick. The surface layer is yellowish brown extremely gravelly loam about 2 inches thick. The subsoil is brownish yellow extremely gravelly loam about 15 inches thick. The substratum to a depth of 60 inches or more is yellow fragmental material.

Permeability of the Arcette soil is rapid. Available water capacity is very low. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is 60 inches or more. Runoff is medium, and the hazard of water erosion is high. The hazard of soil blowing is slight.

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

These soils are poorly suited to cultivated crops and to hay and pasture because of steepness of slope and rough topography.

The Elve and Arcette soils are forested. They are poorly suited to livestock grazing. The potential native understory vegetation on the Elve soil is dominated by grouse whortleberry, common juniper, white spirea, Oregon-grape, and kinnikinnick. The understory provides limited amounts of forage for livestock. Slopes of 30 to 60 percent adversely affect the distribution and management of livestock.

The Elve soil is suited to the production of lodgepole pine. The site index is about 40 for lodgepole pine. At the culmination of the mean annual increment (CMAI), this soil can produce less than 20 cubic feet, or less than 40 board feet (Scribner rule), of lodgepole pine per acre per year. Potential production is estimated for an even-aged, fully stocked stand of trees.

Seedling mortality is moderate, plant competition is moderate, and the hazard of windthrow is moderate. Where slopes are 15 to 30 percent, the hazard of erosion and equipment limitations are slight. Where slopes are 30 to 60 percent, the hazard of erosion and equipment limitations are moderate.

The main limitations of the Elve soil for management of timber are steepness of slope and very low available water capacity. Where slopes are 30 to 60 percent, the kind of equipment that can be used is restricted and its operation is difficult. Competition from understory vegetation and very low available water capacity make establishment of tree seedlings difficult. This soil in places supports dense stands of trees. The large number of trees restricts development of plant roots and results in trees being subject to windthrow. Maintaining small openings and thinning over a period of several years reduce windthrow. Where slopes are 30 to 60 percent, maintaining adequate plant cover in disturbed areas and retaining sediment filter strips of undisturbed vegetation along streams reduce soil erosion and problems of water quality.

The potential native understory vegetation on the Arcette soil is dominated by grouse whortleberry, common juniper, white spirea, and kinnikinnick. The understory provides very limited amounts of forage for livestock. Slopes of 30 to 60 percent adversely affect the distribution and management of livestock.

The Arcette soil is suited to the production of lodgepole pine. This site index is about 30 for lodgepole pine. At the culmination of the mean annual increment

(CMAI), this soil can produce less than 20 cubic feet, or less than 40 board feet (Scribner rule), of lodgepole pine per acre per year. Potential production is estimated for an even-aged, fully stocked stand of trees.

Seedling mortality is severe, plant competition is moderate, and the hazard of windthrow is moderate. Where slopes are 15 to 30 percent, the hazard of erosion and equipment limitations are slight. Where slopes are 30 to 60 percent, the hazard of erosion and equipment limitations are moderate.

The main limitations of the Arcette soil for management of timber are steepness of slope, the content of rock fragments, and very low available water capacity. Where slopes are 30 to 60 percent, the kind of equipment that can be used is restricted and its operation is difficult. Competition from understory vegetation and very low available water capacity make establishment of tree seedlings difficult. This soil in places supports dense stands of trees. The large number of trees restricts development of plant roots and results in trees being subject to windthrow. Maintaining small openings and thinning over a period of several years reduce windthrow. Where slopes are 30 to 60 percent, maintaining adequate plant cover on the disturbed areas and using sediment filter strips of undisturbed vegetation along streams reduce soil erosion and problems of water quality.

This unit is poorly suited to homesite development because of steepness of slope.

This map unit is in capability subclass VIIe, nonirrigated. The Elve soil is in woodland suitability group 7f1 where slopes are 15 to 30 percent and group 7f3 where slopes are 30 to 60 percent. The Arcette soil is in woodland suitability group 7f5 where slopes are 15 to 30 percent and group 7f7 where slopes are 30 to 60 percent.

82—Enbar loam, 0 to 2 percent slopes. This deep, somewhat poorly drained soil is on low terraces and flood plains in the western, central, and southern parts of the county. It formed in alluvium derived from mixed rock sources. Slopes commonly are more than 1,000 feet long. Elevation is 3,500 to 4,500 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 120 days.

Included in this unit are small areas of soils that are similar to this Enbar soil but are underlain by sand and gravel at a depth of 20 to 40 inches.

Typically, the surface layer of this Enbar soil is dark gray loam about 3 inches thick. The next layer is grayish brown loam about 19 inches thick. The upper 7 inches of the underlying material is light brownish gray loam, the next 21 inches is gray loam stratified with fine sandy loam and clay loam, and the lower part to a depth of 60 inches or more is light brownish gray extremely gravelly coarse sandy loam.

Permeability is moderate to a depth of 50 inches and moderately rapid below that depth. Available water capacity is high. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is 60 inches or more. A seasonal high water table is at a depth of 30 to 60 inches in spring and early in summer. Runoff is slow, and the hazard of water erosion is slight except during periods of rare flooding. The hazard of soil blowing is moderate.

This soil is used mainly for hay and pasture and as rangeland.

This soil is poorly suited to cultivated crops because of the seasonal high water table and wetness.

This soil is suited to hay and pasture. It is limited mainly by the seasonal high water table and the hazard of soil blowing. Wetness limits the choice of plants and the period of cutting or grazing and increases the risk of winterkill. Maintaining a good plant cover on this soil helps to control soil blowing.

The potential plant community on this soil is mainly tall sedges, American mannagrass, slender wheatgrass, and prairie cordgrass. If the range is excessively grazed, the proportion of these plants decreases and the proportion of mat muhly, sedges, Baltic rush, and western wheatgrass increases. If excessive grazing continues, plants such as Kentucky bluegrass, timothy, and annuals may invade. The potential plant community produces about 5,500 pounds of air-dry vegetation in years of above-normal precipitation and 4,500 pounds in years of below-normal precipitation.

Mechanical treatment is limited because of the seasonal high water table and wetness. Grazing should be delayed until the soil has sufficiently dried and is firm enough to withstand trampling by livestock.

This soil is well suited to windbreaks, but the seasonal high water table limits the choice of trees and shrubs to those that are water tolerant. Suitable trees for planting are Russian-olive, Siberian crabapple, green ash, Siberian elm, white willow, golden willow, plains cottonwood, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Tatarian honeysuckle, common chokecherry, lilac, skunkbush sumac, purpleosier willow, silver buffaloberry, and redosier dogwood. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings.

This soil is poorly suited to homesite development because of the seasonal high water table and the rare flooding.

This map unit is in capability subclass IVw, nonirrigated, and in Subirrigated range site, 15- to 19-inch precipitation zone.

83—Enbar-Nesda loams, 0 to 2 percent slopes. This map unit is on low terraces and flood plains in the western, central, and southern parts of the county.

Slopes commonly are 250 to 1,000 feet long. Elevation is 3,500 to 4,500 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 120 days.

This unit is about 60 percent Enbar loam and 30 percent Nesda loam. The Enbar soil is on plane side slopes, and the Nesda soil is on slight rises.

Included in this unit are small areas of deep, well drained Sudworth soils. Also included are small areas of Nesda gravelly loam. Included areas make up about 10 percent of the total acreage.

The Enbar soil is deep and somewhat poorly drained. It formed in alluvium derived from mixed rock sources. Typically, the surface layer is dark gray loam about 3 inches thick. The next layer is grayish brown loam about 19 inches thick. The upper 7 inches of the underlying material is light brownish gray loam, the next 21 inches is gray loam stratified with fine sandy loam and clay loam, and the lower part to a depth of 60 inches or more is light brownish gray extremely gravelly coarse sandy loam.

Permeability of the Enbar soil is moderate to a depth of 50 inches and moderately rapid below that depth. Available water capacity is high. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is 60 inches or more. A seasonal high water table is at a depth of 30 to 60 inches. Runoff is slow, and the hazard of water erosion is slight except during periods of rare flooding. The hazard of soil blowing is moderate.

The Nesda soil is deep and well drained. It formed in alluvium derived dominantly from limestone and sandstone. Typically, the surface layer is dark grayish brown loam about 6 inches thick. The next layer is grayish brown loam about 8 inches thick. The upper 2 inches of the underlying material is pale brown very gravelly loamy sand, and the lower part to a depth of 60 inches or more is light brownish gray and grayish brown extremely gravelly sand.

Permeability of the Nesda soil is rapid. Available water capacity is very low to low. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is about 36 inches. Runoff is slow, and the hazard of water erosion is slight except during periods of rare flooding. The hazard of soil blowing is moderate.

The soils in this unit are used mainly for hay and pasture and as rangeland.

These soils are poorly suited to cultivated crops because of the seasonal high water table and wetness.

These soils are suited to hay and pasture. They are limited mainly by the seasonal high water table in the Enbar soil, the low to very low available water capacity of the Nesda soil, and the hazard of soil blowing. For best yields, it is necessary to use a seed mixture consisting of plants that tolerate the wetness of the Enbar soil and plants that tolerate the droughtiness of the Nesda soil. Maintaining a good plant cover helps to control soil blowing.

The potential plant community on the Enbar soil is mainly tall sedges, American mannagrass, slender wheatgrass, and prairie cordgrass. If the range is excessively grazed, the proportion of these plants decreases and the proportion of mat muhly, sedges, Baltic rush, and western wheatgrass increases. If excessive grazing continues, plants such as Kentucky bluegrass, timothy, and annuals may invade. The potential plant community produces about 5,500 pounds of air-dry vegetation in years of above-normal precipitation and 4,500 pounds in years of below-normal precipitation.

The potential plant community on the Nesda soil is mainly western wheatgrass, needleandthread, plains muhly, and prairie junegrass. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of needleandthread, muttongrass, blue grama, and fringed sagewort increases. If excessive grazing continues, plants such as curlycup gumweed, broom snakeweed, perennial weeds, and annuals may invade. The potential plant community produces about 1,800 pounds of air-dry vegetation in years of above-normal precipitation and 800 pounds in years of below-normal precipitation.

Mechanical treatment is limited because of the seasonal high water table and wetness of the Enbar soil. Grazing should be delayed until the soil has dried sufficiently and is firm enough to withstand trampling by livestock.

The Enbar soil is well suited to windbreaks, but the seasonal high water table limits the choice of trees and shrubs to those that are water tolerant. Suitable trees for planting are Russian-olive, Siberian crabapple, green ash, Siberian elm, white willow, golden willow, plains cottonwood, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Tatarian honeysuckle, common chokecherry, lilac, skunkbush sumac, purpleosier willow, silver buffaloberry, and redosier dogwood.

The Nesda soil is suited to windbreaks, but the low available water capacity limits the growth of both trees and shrubs. Suitable trees for planting are Russian-olive, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, western sandcherry, and skunkbush sumac.

Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings on these soils.

These soils are poorly suited to homesite development because of the high water table and the hazard of rare flooding.

This map unit is in capability subclass IVw, nonirrigated. The Enbar soil is in Subirrigated range site, 15- to 19-inch precipitation zone, and the Nesda soil is in

Shallow to Gravel range site, 15- to 19-inch precipitation zone.

84—Ernem clay loam, 2 to 8 percent slopes. This shallow, well drained soil is on uplands in the eastern part of the county. It formed in residuum derived dominantly from hard sandstone. Slopes commonly are 250 to 1,000 feet long. Elevation is 3,000 to 3,800 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 44 degrees F, and the average frost-free period is about 130 days.

Included in this unit are small areas of moderately deep Tanna soils in concave areas and shallow Delplain soils on ridges.

Typically, the surface layer of this Ernem soil is grayish brown heavy loam about 3 inches thick. The next layer is grayish brown clay loam about 3 inches thick. The upper 5 inches of the subsoil is brown very channery clay, and the lower 3 inches is brown extremely channery clay. Gray sandstone is at a depth of about 14 inches. Depth to sandstone ranges from 10 to 20 inches.

Permeability is moderately slow. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. The average annual wetting depth where this soil is under native vegetation is 10 to 20 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

This soil is used as rangeland and for hay and pasture.

This soil is poorly suited to cultivated crops because of the very low available water capacity and the shallow depth to bedrock.

This soil is suited to hay and pasture. It is limited mainly by the very low available water capacity, low precipitation, and the hazards of soil blowing and water erosion. Seedbed preparation and planting on the contour or across the slope, where practical, help to control water erosion. Maintaining a good plant cover helps to control soil blowing and water erosion. Rotation grazing helps to maintain the quality of forage.

The potential plant community on this soil is mainly bluebunch wheatgrass, western wheatgrass, plains muhly, and green needlegrass. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, blue grama, prairie junegrass, and threadleaf sedge increases. If excessive grazing continues, plants such as red threeawn, annuals, and perennial weeds may invade. The potential plant community produces about 1,000 pounds of air-dry vegetation in years of above-normal precipitation and 600 pounds in years of below-normal precipitation.

This soil is suitable for seeding to adapted grasses and forbs if the range is in poor condition. Seedbed preparation and planting on the contour or across the slope, where practical, conserve moisture and help to control water erosion. The surface layer is susceptible to water erosion and soil blowing if it is disturbed or if the range is overgrazed.

This soil is poorly suited to windbreaks. It is limited mainly by the very low available water capacity.

The main limitations for homesite development on this soil are moderately slow permeability, shallow depth to bedrock, shrink-swell potential, and potential frost action. The soil is severely limited for septic tank absorption fields because of the moderately slow permeability and shallow depth to bedrock. Cuts to level building sites can expose bedrock. Shrinking and swelling and frost action can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential.

This map unit is in capability subclass VIs, nonirrigated, and in Shallow range site, 10- to 14-inch precipitation zone.

85—Ernem very stony loam, 2 to 8 percent slopes. This shallow, well drained soil is on uplands in the eastern part of the county. It formed in residuum derived dominantly from hard sandstone. Slopes commonly are 250 to 1,000 feet long. Elevation is 3,000 to 3,800 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 44 degrees F, and the average frost-free period is about 130 days.

Included in this unit are small areas of moderately deep Tanna soils in concave areas.

Typically, the surface layer of this Ernem soil is grayish brown very stony loam about 3 inches thick. The next layer is grayish brown very stony loam about 3 inches thick. The upper 5 inches of the subsoil is brown very channery clay, and the lower 3 inches is brown extremely channery clay. Gray sandstone is at a depth of about 14 inches. Depth to sandstone ranges from 10 to 20 inches.

Permeability is moderately slow. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. The average annual wetting depth where this soil is under native vegetation is 10 to 20 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is slight.

This soil is used as rangeland.

This soil is poorly suited to cultivated crops and to hay and pasture because of the large stones in the surface layer, the very low available water capacity, and the shallow depth to bedrock.

The potential plant community on this soil is mainly bluebunch wheatgrass, western wheatgrass, plains muhly, and green needlegrass. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, blue grama, prairie junegrass, and threadleaf sedge

increases. If excessive grazing continues, plants such as red threeawn, annuals, and perennial weeds may invade. The potential plant community produces about 1,000 pounds of air-dry vegetation in years of above-normal precipitation and 600 pounds in years of below-normal precipitation.

This soil is not suited to mechanical treatment because of the large stones in the surface layer. The surface layer is susceptible to water erosion and soil blowing if it is disturbed or if the range is overgrazed.

This soil is poorly suited to windbreaks. It is limited by stoniness and the very low available water capacity.

The main limitations for homesite development on this soil are the moderately slow permeability, shallow depth to sandstone, shrink-swell potential, potential frost action, and content of rock fragments. The soil is severely limited for septic tank absorption fields because of the moderately slow permeability and shallow depth to sandstone. Cuts to level building sites can expose sandstone. Shrinking and swelling and frost action can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential. Removal of stones is needed when landscaping, particularly in areas used for lawns.

This map unit is in capability subclass VIs, nonirrigated, and in Shallow range site, 10- to 14-inch precipitation zone.

86—Ernem-Delplain-Tanna complex, 4 to 25 percent slopes. This map unit is on uplands in the east-central part of the county. Slopes commonly are 250 to 1,000 feet long. Elevation is 3,000 to 3,800 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 44 degrees F, and the average frost-free period is about 130 days.

This unit is about 40 percent Ernem channery clay loam, 25 percent Delplain very channery clay loam, and 20 percent Tanna clay loam. The Ernem soil is on plane side slopes, the Delplain soil is on ridges, and the Tanna soil is on plane and concave side slopes.

Included in this unit are small areas of moderately deep Weingart soils on plane side slopes and small areas of Rock outcrop. The Weingart soils are salt- and alkali-affected.

The Ernem soil is shallow and well drained. It formed in residuum derived dominantly from hard sandstone. Typically, the surface layer is grayish brown channery clay loam about 3 inches thick. The next layer is grayish brown channery clay loam about 3 inches thick. The upper 5 inches of the subsoil is brown very channery clay, and the lower 3 inches is brown extremely channery clay. Gray sandstone is at a depth of about 14 inches. Depth to sandstone ranges from 10 to 20 inches.

Permeability of the Ernem soil is moderately slow. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. The average annual wetting depth where this soil is under native vegetation is 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

The Delplain soil is shallow and well drained. It formed in residuum derived dominantly from hard shale and sandstone. Typically, the surface layer is grayish brown very channery clay loam about 4 inches thick. The underlying material is grayish brown extremely channery clay loam about 14 inches thick. Light gray shale and sandstone are at a depth of about 18 inches. Depth to shale and sandstone ranges from 10 to 20 inches.

Permeability of the Delplain soil is moderately slow. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. The average annual wetting depth where this soil is under native vegetation is 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

The Tanna soil is moderately deep and well drained. It formed in residuum derived dominantly from semiconsolidated shale interbedded with sandstone. Typically, the surface layer is grayish brown clay loam about 6 inches thick. The upper 6 inches of the subsoil is grayish brown silty clay, and the lower 15 inches is light grayish brown and gray silty clay loam. The substratum is light gray silty clay loam about 5 inches thick. Light gray shale and sandstone are at a depth of about 32 inches. Depth to shale and sandstone ranges from 20 to 40 inches.

Permeability of the Tanna soil is slow. Available water capacity is low. Effective rooting depth is 20 to 40 inches. The average annual wetting depth where this soil is under native vegetation is 20 to 22 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

The soils in this unit are used as rangeland.

These soils are poorly suited to cultivated crops and to hay and pasture because of shallow depth to bedrock and the very low available water capacity of the Ernem and Delplain soils.

The potential plant community on the Ernem soil is mainly bluebunch wheatgrass, western wheatgrass, plains muhly, and green needlegrass. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, blue grama, prairie junegrass, and threadleaf sedge increases. If excessive grazing continues, plants such as red threeawn, annuals, and perennial weeds may invade. The potential plant community produces about 1,000 pounds of air-dry vegetation in years of above-normal precipitation and 600 pounds in years of below-normal precipitation.

The potential plant community on the Delplain soil is mainly western wheatgrass, bluebunch wheatgrass, prairie sandreed, and green needlegrass. If the range is

excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, blue grama, prairie junegrass, and fringed sagewort increases. If excessive grazing continues, plants such as red threeawn, pricklypear, broom snakeweed, and annuals may invade. The potential plant community produces about 900 pounds of air-dry vegetation in years of above-normal precipitation and 300 pounds in years of below-normal precipitation.

The potential plant community on the Tanna soil is mainly western wheatgrass, green needlegrass, bluebunch wheatgrass, and thickspike wheatgrass. If the range is excessively grazed, the proportion of these plants decreases and the proportion of plains reedgrass, blue grama, Sandberg bluegrass, and fringed sagewort increases. If excessive grazing continues, plants such as perennial weeds, broom snakeweed, annuals, and clubmoss may invade. The potential plant community produces about 1,400 pounds of air-dry vegetation in years of above-normal precipitation and 800 pounds in years of below-normal precipitation.

These soils are poorly suited to mechanical treatment because of the shallow depth to bedrock in the Ernem and Delplain soils and the included areas of Rock outcrop.

These soils are poorly suited to windbreaks. They are limited mainly by the very low available water capacity.

The soils in this unit are poorly suited to homesite development. The main limitations are moderately slow and slow permeability, shallow and moderate depth to sandstone and shale, shrink-swell potential, potential frost action, and content of rock fragments. The soils are severely limited for septic tank absorption fields because of the moderately slow and slow permeability and shallow and moderate depth to sandstone and shale. Cuts to level building sites can expose sandstone and shale. Shrinking and swelling and frost action can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential. Removal of pebbles and cobbles in disturbed areas is needed for best results when landscaping, particularly in areas used for lawns.

This map unit is in capability subclass VIe, nonirrigated. The Ernem and Delplain soils are in Shallow range site, 10- to 14-inch precipitation zone, and the Tanna soil is in Clayey range site, 10- to 14-inch precipitation zone.

87—Ethridge silty clay loam, 0 to 2 percent slopes. This deep, well drained soil is on terraces in the eastern and northern parts of the county. It formed in alluvium derived dominantly from shale and sandstone. Slopes commonly are more than 1,000 feet long. Elevation is 2,200 to 3,800 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 44 degrees F, and the average frost-free period is about 130 days.

Included in this unit are small areas of deep Evanston soils.

Typically, the surface layer of this Ethridge soil is grayish brown silty clay loam about 6 inches thick. The upper 10 inches of the subsoil is brown and light brownish gray silty clay, and the lower 15 inches is light brownish gray silty clay loam. The substratum to a depth of 60 inches or more is light brownish gray and light gray silty clay.

Permeability is slow. Available water capacity is high. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is about 22 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is slight.

This soil is used mainly for nonirrigated crops such as wheat, barley, and oats. It is also used for hay and pasture and as rangeland.

This soil is well suited to nonirrigated crops. It is limited mainly by low precipitation. Because precipitation is not sufficient for annual cropping, a cropping system that includes small grain and summer fallow is most suitable. Crop residue left on or near the surface helps to conserve moisture, increases the water intake rate, and improves tilth. Tillage should be kept to a minimum.

The potential plant community on this soil is mainly western wheatgrass, green needlegrass, bluebunch wheatgrass, and thickspike wheatgrass. If the range is excessively grazed, the proportion of these plants decreases and the proportion of plains reedgrass, blue grama, Sandberg bluegrass, and fringed sagewort increases. If excessive grazing continues, plants such as perennial weeds, broom snakeweed, annuals, and clubmoss may invade. The potential plant community produces about 1,400 pounds of air-dry vegetation in years of above-normal precipitation and 800 pounds in years of below-normal precipitation.

This soil is suitable for seeding to adapted grasses and forbs if the range is in poor condition.

This soil is well suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian crabapple, green ash, Siberian elm, white willow, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and cotoneaster. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings.

The main limitations for homesite development on this soil are slow permeability, shrink-swell potential, and low soil strength. If the soil is used for septic tank absorption fields, the slow permeability can be overcome by increasing the size of the absorption field. Shrinking and

swelling and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential.

This map unit is in capability subclass IIIc, nonirrigated, and in Clayey range site, 10- to 14-inch precipitation zone.

88—Ethridge silty clay loam, 2 to 8 percent slopes. This deep, well drained soil is on fans and terraces in the eastern and northern parts of the county. It formed in alluvium derived dominantly from shale and sandstone. Slopes commonly are more than 1,000 feet long. Elevation is 2,200 to 3,800 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 44 degrees F, and the average frost-free period is about 130 days.

Included in this unit are small areas of deep Evanston soils.

Typically, the surface layer of this Ethridge soil is grayish brown silty clay loam about 6 inches thick. The upper 10 inches of the subsoil is brown and light brownish gray silty clay, and the lower 15 inches is light brownish gray silty clay loam. The substratum to a depth of 60 inches or more is light brownish gray and light gray silty clay.

Permeability is slow. Available water capacity is high. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is about 22 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is slight.

This soil is used mainly for nonirrigated crops such as wheat, barley, and oats. It is also used for hay and pasture and as rangeland.

This soil is well suited to nonirrigated crops. It is limited mainly by low precipitation and the hazard of water erosion. Because precipitation is not sufficient for annual cropping, a cropping system that includes small grains and summer fallow is best. Minimum tillage, contour cultivation, grassed waterways, stripcropping, and growing sod crops such as hay and pasture help to control water erosion. Return of crop residue to the soil helps to maintain good tilth and improves the water intake rate.

The potential plant community on this soil is mainly western wheatgrass, green needlegrass, bluebunch wheatgrass and thickspike wheatgrass. If the range is excessively grazed, the proportion of these plants decreases and the proportion of plains reedgrass, blue grama, Sandberg bluegrass, and fringed sagewort increases. If excessive grazing continues, plants such as perennial weeds, broom snakeweed, annuals, and clubmoss may invade. The potential plant community produces about 1,400 pounds of air-dry vegetation in years of above-normal precipitation and 800 pounds in years of below-normal precipitation.

Where clubmoss and blue grama are the dominant vegetation, pitting, furrowing, chiseling, or other mechanical treatment practices can be used to improve depleted rangeland. This soil is suitable for seeding to adapted grasses and forbs if the range is in poor condition. Seedbed preparation and planting on the contour or across the slope, where practical, conserve moisture and help to control water erosion. The surface layer is more susceptible to water erosion if it is disturbed or if the range is overgrazed.

This soil is well suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian crabapple, green ash, Siberian elm, white willow, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and cotoneaster. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings.

This soil is suited to homesite development. The main limitations are slow permeability, shrink-swell potential, and low soil strength. If the soil is used for septic tank absorption fields, the slow permeability can be overcome by increasing the size of the absorption field. Shrinking and swelling and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential.

This map unit is in capability subclass IIIe, nonirrigated, and in Clayey range site, 10- to 14-inch precipitation zone.

89—Ethridge-Cabston complex, 2 to 8 percent slopes. This map unit is on fans and terraces in the eastern part of the county. Slopes commonly are 250 to 1,000 feet long. Elevation is 3,000 to 3,800 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 44 degrees F, and the average frost-free period is about 130 days.

This unit is about 60 percent Ethridge silty clay loam and about 30 percent Cabston clay loam. The Ethridge soil is on plane and concave side slopes, and the Cabston soil is on the higher convex side slopes of fans.

Included in this unit is about 10 percent Cabston channery clay loam.

The Ethridge soil is deep and well drained. It formed in alluvium derived dominantly from shale and sandstone. Typically, the surface layer is grayish brown silty clay loam about 6 inches thick. The upper 10 inches of the subsoil is brown and light brownish gray silty clay, and the lower 15 inches is light brownish gray silty clay loam.

The substratum to a depth of 60 inches or more is light brownish gray and light gray silty clay.

Permeability of the Ethridge soil is slow. Available water capacity is high. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is about 22 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is slight.

The Cabston soil is deep and well drained. It formed in alluvium derived dominantly from shale and sandstone. Typically, the surface layer is grayish brown clay loam about 4 inches thick. The subsoil is grayish brown and light brownish gray very channery clay loam about 17 inches thick. The substratum to a depth of 66 inches or more is light brownish gray very channery clay loam.

Permeability of the Cabston soil is moderately slow. Available water capacity is low to moderate. Effective rooting depth is 66 inches or more. The average annual wetting depth where this soil is under native vegetation is about 22 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

The soils in this unit are used mainly for nonirrigated crops such as wheat, barley, and oats. They are also used for hay and pasture and as rangeland.

These soils are well suited to nonirrigated crops. They are limited mainly by low precipitation and the hazards of water erosion and soil blowing. Because precipitation is not sufficient for annual cropping, a cropping system that includes small grains and summer fallow is best. Minimum tillage, contour cultivation, grassed waterways, stripcropping, and growing sod crops such as hay and pasture help to control water erosion and soil blowing. Returning crop residue to the soil helps to maintain good tilth and improves the water intake rate.

The potential plant community on these soils is mainly western wheatgrass, green needlegrass, bluebunch wheatgrass, and thickspike wheatgrass. If the range is excessively grazed, the proportion of these plants decreases and the proportion of plains reedgrass, blue grama, Sandberg bluegrass, and fringed sagewort increases. If excessive grazing continues, plants such as perennial weeds, broom snakeweed, annuals, and clubmoss may invade. The potential plant community produces about 1,400 pounds of air-dry vegetation in years of above-normal precipitation and 800 pounds in years of below-normal precipitation.

Where clubmoss and blue grama are the dominant vegetation, pitting, furrowing, chiseling, or other mechanical treatment practices can be used to improve depleted rangeland. These soils are suitable for seeding to adapted grasses and forbs if the range is in poor condition. Seedbed preparation and planting on the contour or across the slope, where practical, conserve moisture and help to control water erosion. The surface layer is susceptible to water erosion and soil blowing if it is disturbed or if the range is overgrazed.

The Ethridge soil is well suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian crabapple, green ash, Siberian elm, white willow, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and cotoneaster.

The Cabston soil is suited to windbreaks, but the low to moderate available water capacity of the soil limits the growth of both trees and shrubs. Suitable trees for planting are Russian-olive, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, western sandcherry, and skunkbush sumac.

Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings on these soils. Planting on the contour helps to conserve moisture.

The main limitations for homesite development on the soils in this unit are slow and moderately slow permeability, shrink-swell potential, and low soil strength. If the soils are used for septic tank absorption fields, the slow and moderately slow permeability can be overcome by increasing the size of the absorption field. Shrinking and swelling and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential.

This map unit is in capability subclass IIIe, nonirrigated, and in Clayey range site, 10- to 14-inch precipitation zone.

90—Evanston loam, 0 to 2 percent slopes. This deep, well drained soil is on terraces and fans in the eastern part of the county. It formed in alluvium. Slopes commonly are more than 1,000 feet long. Elevation is 2,600 to 3,400 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 44 degrees F, and the average frost-free period is about 130 days.

Included in this unit are small areas of deep Chinook and Ethridge soils.

Typically, the surface layer of this Evanston soil is grayish brown loam about 5 inches thick. The upper 9 inches of the subsoil is brown and pale brown clay loam, and the lower 22 inches is light brownish gray loam. The substratum to a depth of 60 inches or more is light brownish gray loam stratified with fine sandy loam.

Permeability is moderate. Available water capacity is high. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is about 24 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

This soil is used mainly for nonirrigated crops such as wheat, barley, and oats. It is also used for hay and pasture and as rangeland.

This soil is well suited to nonirrigated crops. It is limited mainly by low precipitation and the hazard of soil blowing. Because precipitation is not sufficient for annual cropping, a cropping system that includes small grains and summer fallow is best. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, stubble-mulch tillage, and growing sod crops such as hay and pasture help to control soil blowing.

The potential plant community on this soil is mainly bluebunch wheatgrass, western wheatgrass, green needlegrass, and needleandthread. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of needleandthread, blue grama, prairie junegrass, and fringed sagewort increases. If excessive grazing continues, plants such as pricklypear, perennial weeds, annuals, and clubmoss may invade. The potential plant community produces about 1,400 pounds of air-dry vegetation in years of above-normal precipitation and 800 pounds in years of below-normal precipitation.

This soil is suitable for seeding to adapted grasses and forbs if the range is in poor condition. The surface layer is susceptible to soil blowing if it is disturbed or if the range is overgrazed.

This soil is well suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian crabapple, green ash, Siberian elm, white willow, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and cotoneaster. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings.

The main limitations for homesite development on this soil are moderate permeability, potential frost action, and low soil strength. If the soil is used for septic tank absorption fields, the moderate permeability can be overcome by increasing the size of the absorption field. Frost action and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations.

This map unit is in capability subclass IIIe, nonirrigated, and in Silty range site, 10- to 14-inch precipitation zone.

91—Evanston loam, 2 to 8 percent slopes. This deep, well drained soil is on terraces and fans in the eastern part of the county. It formed in alluvium. Slopes commonly are 250 to 1,000 feet long. Elevation is 2,600 to 3,400 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 44 degrees F, and the average frost-free period is about 130 days.

Included in this unit are small areas of deep Ethridge soils.

Typically, the surface layer of this Evanston soil is grayish brown loam about 5 inches thick. The upper 9 inches of the subsoil is brown and pale brown clay loam, and the lower 22 inches is light brownish gray loam. The substratum to a depth of 60 inches or more is light brownish gray loam stratified with fine sandy loam.

Permeability is moderate. Available water capacity is high. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is about 24 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

This soil is used mainly for nonirrigated crops such as wheat, barley, and oats. It is also used for hay and pasture and as rangeland.

This soil is well suited to nonirrigated crops. It is limited mainly by low precipitation and the hazards of soil blowing and water erosion. Because precipitation is not sufficient for annual cropping, a cropping system that includes small grains and summer fallow is best. Minimum tillage, contour cultivation, grassed waterways, stripcropping, and growing sod crops such as hay and pasture help to control soil blowing and water erosion. Tall grass barriers trap snow, which increases the amount of moisture in the soil.

The potential plant community on this soil is mainly bluebunch wheatgrass, western wheatgrass, green needlegrass, and needleandthread. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of needleandthread, blue grama, prairie junegrass, and fringed sagewort increases. If excessive grazing continues, plants such as pricklypear, perennial weeds, annuals, and clubmoss may invade. The potential plant community produces about 1,400 pounds of air-dry vegetation in years of above-normal precipitation and 800 pounds in years of below-normal precipitation.

Where clubmoss and blue grama are the dominant vegetation, pitting, furrowing, chiseling, or other mechanical treatment practices can be used to improve depleted rangeland. This soil is suitable for seeding to adapted grasses and forbs if the range is in poor condition. Seedbed preparation and planting on the contour or across the slope, where practical, conserve moisture and help to control water erosion. The surface layer is susceptible to water erosion and soil blowing if it is disturbed or if the range is overgrazed.

This soil is well suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian crabapple, green ash, Siberian elm, white willow, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and cotoneaster. Summer fallow, cultivation for weed control, and adapted

plants are needed to insure establishment and survival of seedlings.

The main limitations for homesite development on this soil are moderate permeability, potential frost action, and low soil strength. If the soil is used for septic tank absorption fields, the moderate permeability can be overcome by increasing the size of the absorption field. Frost action and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations.

This map unit is in capability subclass IIIe, nonirrigated, and in Silty range site, 10- to 14-inch precipitation zone.

92—Fairfield clay loam, 0 to 2 percent slopes. This deep, well drained soil is on terraces in the central and western parts of the county. It formed in alluvium derived dominantly from limestone. Slopes commonly are more than 1,000 feet long. Elevation is 3,500 to 4,200 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 120 days.

Included in this unit are small areas of deep Judith soils on slight rises and deep Danvers soils on plane side slopes.

Typically, the surface layer of this Fairfield soil is dark grayish brown clay loam about 6 inches thick. The subsoil is brown silty clay loam about 3 inches thick. The upper 32 inches of the substratum is light gray and white silty clay loam, and the lower part to a depth of 60 inches or more is brownish yellow very gravelly sandy loam.

Permeability is moderately slow to a depth of about 43 inches and moderately rapid below that depth. Available water capacity is moderate to high. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is about 30 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

This soil is used for nonirrigated crops, mainly wheat, barley, oats, alfalfa, and grass for hay and pasture. It is also used as rangeland.

This soil is well suited to nonirrigated crops. It is limited mainly by low precipitation and the hazard of soil blowing. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, stubble-mulch tillage, and growing sod crops such as hay and pasture help to control soil blowing.

The potential plant community on this soil is mainly bluebunch wheatgrass, green needlegrass, western wheatgrass, and Idaho fescue. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of Idaho fescue, plains reedgrass, Sandberg bluegrass, and blue grama increases. If excessive grazing continues, plants such as broom snakeweed, Kentucky bluegrass, perennial weeds, and annuals may invade. The potential plant community produces about 2,300 pounds of air-dry vegetation in years of above-normal precipitation and 1,700 pounds in years of below-normal precipitation.

This soil is suitable for seeding to adapted grasses and forbs if the range is in poor condition. The surface layer is susceptible to soil blowing if it is disturbed or if the range is overgrazed.

This soil is well suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian crabapple, green ash, Siberian elm, white willow, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and cotoneaster. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings.

The main limitations for homesite development on this soil are moderately slow permeability, shrink-swell potential, and low soil strength. If the soil is used for septic tank absorption fields, the moderately slow permeability can be overcome by increasing the size of the absorption field. Shrinking and swelling and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential.

This map unit is in capability subclass IIIe, nonirrigated, and in Clayey range site, 15- to 19-inch precipitation zone.

93—Fairfield-Danvers clay loams, 0 to 2 percent slopes. This map unit is on terraces in the western part of the county. Slopes commonly are more than 1,000 feet long. Elevation is 3,500 to 4,200 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 120 days.

This unit is about 60 percent Fairfield clay loam and 30 percent Danvers clay loam. The Fairfield soil is on plane side slopes, and the Danvers soil is in slightly concave areas.

Included in this unit is about 10 percent Judith soils on slightly convex rises.

The Fairfield soil is deep and well drained. It formed in alluvium derived dominantly from limestone. Typically, the surface layer is dark grayish brown clay loam about 6 inches thick. The subsoil is brown silty clay loam about 3 inches thick. The upper 32 inches of the substratum is light gray and white silty clay loam, and the lower part to a depth of 60 inches or more is brownish yellow very gravelly sandy loam.

Permeability of the Fairfield soil is moderately slow to a depth of about 43 inches and moderately rapid below that depth. Available water capacity is moderate to high.

Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is about 30 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

The Danvers soil is deep and well drained. It formed in alluvium derived dominantly from limestone. Typically, the surface layer is dark grayish brown clay loam about 2 inches thick. The next layer is dark grayish brown silty clay loam about 2 inches thick. The upper 10 inches of the subsoil is brown silty clay, and the lower 3 inches is grayish brown clay. The upper 10 inches of the substratum is light yellowish brown clay, the next 17 inches is very pale brown clay loam, and the lower part to a depth of 60 inches or more is very pale brown gravelly clay loam.

Permeability of the Danvers soil is slow to a depth of 44 inches and moderately slow below this depth. Available water capacity is high. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is about 26 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

The soils in this unit are used for nonirrigated crops, mainly wheat, barley, oats, alfalfa, and grass for hay and pasture. They are also used as rangeland.

These soils are well suited to nonirrigated crops. They are limited mainly by low precipitation and the hazard of soil blowing. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, stubble-mulch tillage, and growing sod crops such as hay and pasture help to control soil blowing.

The potential plant community on these soils is mainly bluebunch wheatgrass, green needlegrass, western wheatgrass, and Idaho fescue. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of Idaho fescue, plains reedgrass, Sandberg bluegrass, and blue grama increases. If excessive grazing continues, plants such as broom snakeweed, Kentucky bluegrass, perennial weeds, and annuals may invade. The potential plant community produces about 2,300 pounds of air-dry vegetation in years of above-normal precipitation and 1,700 pounds in years of below-normal precipitation.

These soils are suitable for seeding to adapted grasses and forbs if the range is in poor condition. The surface layer is susceptible to soil blowing if it is disturbed or if the range is overgrazed.

These soils are well suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian crabapple, green ash, Siberian elm, white willow, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and cotoneaster. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings.

The main limitations for homesite development on the soils in this unit are moderately slow and slow permeability, shrink-swell potential, and low soil strength. If the soils are used for septic tank absorption fields, the moderately slow and slow permeability can be overcome by increasing the size of the absorption field. Shrinking and swelling and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential.

This map unit is in capability subclass IIIe, nonirrigated, and in Clayey range site, 15- to 19-inch precipitation zone.

94—Fairfield-Danvers clay loams, 2 to 4 percent slopes. This map unit is on terraces in the western part of the county. Slopes commonly are 250 to 1,000 feet long. Elevation is 3,500 to 4,200 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 120 days.

This unit is about 45 percent Fairfield clay loam and 40 percent Danvers clay loam. The Fairfield soil is on plane and convex side slopes, and the Danvers soil is in slightly concave areas.

Included in this unit are small areas of deep Judell and Judith soils in convex areas. Included areas make up about 15 percent of the total acreage.

The Fairfield soil is deep and well drained. It formed in alluvium derived dominantly from limestone. Typically, the surface layer is dark grayish brown clay loam about 6 inches thick. The subsoil is brown silty clay loam about 3 inches thick. The upper 32 inches of the substratum is light gray and white silty clay loam, and the lower part to a depth of 60 inches or more is brownish yellow very gravelly sandy loam.

Permeability of the Fairfield soil is moderately slow to a depth of about 43 inches and moderately rapid below that depth. Available water capacity is moderate to high. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is about 30 inches. Runoff is slow, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

The Danvers soil is deep and well drained. It formed in alluvium derived dominantly from limestone. Typically, the surface layer is dark grayish brown clay loam about 2 inches thick. The next layer is dark grayish brown silty clay loam about 2 inches thick. The upper 10 inches of the subsoil is brown silty clay, and the lower 3 inches is grayish brown light clay. The upper 10 inches of the substratum is light yellowish brown clay, the next 17 inches is very pale brown clay loam, and the lower part

to a depth of 60 inches or more is very pale brown gravelly clay loam.

Permeability of the Danvers soil is slow to a depth of 44 inches and moderately slow below this depth. Available water capacity is high. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is about 26 inches. Runoff is slow, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

The soils in this unit are used for nonirrigated crops, mainly wheat, barley, oats, alfalfa, and grass for hay and pasture. They are also used as rangeland.

These soils are well suited to nonirrigated crops. They are limited mainly by low precipitation and the hazards of water erosion and soil blowing. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, stubble-mulch tillage, grassed waterways, and growing sod crops such as hay and pasture help to control soil blowing and water erosion.

The potential plant community on these soils is mainly bluebunch wheatgrass, green needlegrass, western wheatgrass, and Idaho fescue. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of Idaho fescue, plains reedgrass, Sandberg bluegrass, and blue grama increases. If excessive grazing continues, plants such as broom snakeweed, Kentucky bluegrass, perennial weeds, and annuals may invade. The potential plant community produces about 2,300 pounds of air-dry vegetation in years of above-normal precipitation and 1,700 pounds in years of below-normal precipitation.

These soils are suitable for seeding to adapted grasses and forbs if the range is in poor condition. Seedbed preparation and planting on the contour or across the slope, where practical, conserve moisture and help to control water erosion. The surface layer is susceptible to water erosion and soil blowing if it is disturbed or if the range is overgrazed.

These soils are well suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian crabapple, green ash, Siberian elm, white willow, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and cotoneaster. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings.

The main limitations for homesite development on the soils in this unit are moderately slow and slow permeability, shrink-swell potential, and low soil strength. If the soils are used for septic tank absorption fields, the moderately slow and slow permeability can be overcome by increasing the size of the absorption field. Shrinking and swelling and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential.

This map unit is in capability subclass IIIe, nonirrigated, and in Clayey range site, 15- to 19-inch precipitation zone.

95—Fairfield-Judell clay loams, 0 to 2 percent slopes. This map unit is on terraces in the western part of the county. Slopes commonly are more than 1,000 feet long. Elevation is 3,500 to 4,200 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 120 days.

This unit is about 50 percent Fairfield clay loam and 30 percent Judell clay loam. The Fairfield soil is on plane side slopes, and the Judell soil is on slight rises.

Included in this unit are about 10 percent deep Judith soils on slight rises and 10 percent deep Danvers soils on plane and concave side slopes.

The Fairfield soil is deep and well drained. It formed in alluvium derived dominantly from limestone. Typically, the surface layer is dark grayish brown clay loam about 6 inches thick. The subsoil is brown silty clay loam about 3 inches thick. The upper 32 inches of the substratum is light gray and white silty clay loam, and the lower part to a depth of 60 inches or more is brownish yellow very gravelly sandy loam.

Permeability of the Fairfield soil is moderately slow to a depth of about 43 inches and moderately rapid below that depth. Available water capacity is moderate to high. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is about 30 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

The Judell soil is deep and well drained. It formed in alluvium derived dominantly from limestone. Typically, the surface layer is dark grayish brown clay loam about 7 inches thick. The subsoil is pale brown and very pale brown clay loam about 20 inches thick. The upper 26 inches of the substratum is very pale brown loam, and the lower part to a depth of 66 inches or more is pale brown extremely gravelly loam.

Permeability of the Judell soil is moderate to a depth of 53 inches and moderately rapid below that depth. Available water capacity is high. Effective rooting depth is about 66 inches. The average annual wetting depth where this soil is under native vegetation is about 30 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high.

The soils in this unit are used for nonirrigated crops, mainly wheat, barley, oats, alfalfa, and grass for hay and pasture. They are also used as rangeland.

These soils are well suited to nonirrigated crops. They are limited mainly by low precipitation and the hazard of soil blowing. Stripcropping, tall grass barriers, field

windbreaks, minimum tillage, stubble-mulch tillage, and growing sod crops such as hay and pasture help to control soil blowing.

The potential plant community on these soils is mainly bluebunch wheatgrass, green needlegrass, western wheatgrass, and Idaho fescue. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of Idaho fescue, plains reedgrass, Sandberg bluegrass, and blue grama increases. If excessive grazing continues, plants such as broom snakeweed, Kentucky bluegrass, perennial weeds, and annuals may invade. The potential plant community produces about 2,300 pounds of air-dry vegetation in years of above-normal precipitation and 1,700 pounds in years of below-normal precipitation.

These soils are suitable for seeding to adapted grasses and forbs if the range is in poor condition. The surface layer is susceptible to water erosion and soil blowing if it is disturbed or if the range is overgrazed.

These soils are well suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian crabapple, green ash, Siberian elm, white willow, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and cotoneaster. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings.

The main limitations for homesite development on the soils in this unit are moderately slow to moderate permeability, shrink-swell potential, and low soil strength. If the soils are used for septic tank absorption fields, the moderately slow to moderate permeability can be overcome by increasing the size of the absorption field. Shrinking and swelling and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential.

This map unit is in capability subclass IIIe, nonirrigated, and in Clayey range site, 15- to 19-inch precipitation zone.

96—Fairfield-Judell clay loams, 2 to 8 percent slopes. This map unit is on terraces and fans in the western part of the county. Slopes commonly are 250 to 1,000 feet long. Elevation is 3,500 to 4,200 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 120 days.

This unit is about 50 percent Fairfield clay loam and 40 percent Judell clay loam. The Fairfield soil is on plane side slopes, and the Judell soil is on ridges.

Included in this unit is about 10 percent deep Judith soils on ridges.

The Fairfield soil is deep and well drained. It formed in alluvium derived dominantly from limestone. Typically, the surface layer is dark grayish brown clay loam about 6 inches thick. The subsoil is brown silty clay loam about 3 inches thick. The upper 32 inches of the substratum is light gray and white silty clay loam, and the lower part to a depth of 60 inches or more is brownish yellow very gravelly sandy loam.

Permeability of the Fairfield soil is moderately slow to a depth of about 43 inches and moderately rapid below that depth. Available water capacity is moderate to high. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is about 30 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

The Judell soil is deep and well drained. It formed in alluvium derived dominantly from limestone. Typically, the surface layer is dark grayish brown clay loam about 7 inches thick. The subsoil is pale brown and very pale brown clay loam about 20 inches thick. The upper 26 inches of the substratum is very pale brown loam, and the lower part to a depth of 66 inches or more is pale brown extremely gravelly loam.

Permeability of the Judell soil is moderate to a depth of 53 inches and moderately rapid below that depth. Available water capacity is high. Effective rooting depth is about 66 inches. The average annual wetting depth where this soil is under native vegetation is about 30 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high.

The soils in this unit are used for nonirrigated crops, mainly wheat, barley, oats, alfalfa, and grass for hay and pasture. They are also used as rangeland.

These soils are well suited to nonirrigated crops. They are limited mainly by low precipitation and the hazards of soil blowing and water erosion. Minimum tillage, contour cultivation, grassed waterways, stripcropping, and growing sod crops such as hay and pasture help to control soil blowing and water erosion.

The potential plant community on these soils is mainly bluebunch wheatgrass, green needlegrass, western wheatgrass, and Idaho fescue. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of Idaho fescue, plains reedgrass, Sandberg bluegrass, and blue grama increases. If excessive grazing continues, plants such as broom snakeweed, Kentucky bluegrass, perennial weeds, and annuals may invade. The potential plant community produces about 2,300 pounds of air-dry vegetation in years of above-normal precipitation and 1,700 pounds in years of below-normal precipitation.

These soils are suitable for seeding to adapted grasses and forbs if the range is in poor condition. Seedbed preparation and planting on the contour or across the slope, where practical, conserve moisture and help to control water erosion. The surface layer is

susceptible to water erosion and soil blowing if it is disturbed or if the range is overgrazed.

These soils are well suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian crabapple, green ash, Siberian elm, white willow, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and cotoneaster. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings. Planting on the contour helps to conserve moisture.

The main limitations for homesite development on the soils in this unit are moderately slow to moderate permeability, shrink-swell potential, and low soil strength. If the soils are used for septic tank absorption fields, the moderately slow to moderate permeability can be overcome by increasing the size of the absorption field. Shrinking and swelling and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential.

This map unit is in capability subclass IIIe, nonirrigated, and in Clayey range site, 15- to 19-inch precipitation zone.

97—Farnuf loam, 0 to 4 percent slopes. This deep, well drained soil is on fans and terraces in the central and western parts of the county. It formed in alluvium. Slopes commonly are 250 to 1,000 feet long. Elevation is 3,500 to 4,000 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 120 days.

Included in this unit are small areas of deep Shambo soils on fans.

Typically, the surface layer of this Farnuf loam is grayish brown loam about 5 inches thick. The upper 7 inches of the subsoil is brown clay loam, and the lower 9 inches is light brownish gray clay loam. The upper 18 inches of the substratum is light brownish gray loam, and the lower part to a depth of 64 inches or more is light yellowish brown clay loam.

Permeability is moderate. Available water capacity is high. Effective rooting depth is about 64 inches. The average annual wetting depth where this soil is under native vegetation is about 30 inches. Runoff is slow, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

This soil is used for nonirrigated crops, mainly wheat, barley, oats, alfalfa, and grass for hay and pasture. It is also used as rangeland.

This soil is well suited to nonirrigated crops. It is limited mainly by low precipitation and the hazards of water erosion and soil blowing. Soil blowing and water erosion can be controlled by stripcropping, tall grass barriers, field windbreaks, minimum tillage, stubble-mulch tillage, grassed waterways, and growing sod crops such as hay and pasture.

The potential plant community on this soil is mainly bluebunch wheatgrass, green needlegrass, western wheatgrass, and needleandthread. If the range is excessively grazed, the proportion of some of these plants decreases and the proportion of western wheatgrass, needleandthread, Sandberg bluegrass, and blue grama increases. If excessive grazing continues, plants such as Kentucky bluegrass, timothy, clubmoss, and perennial weeds may invade. The potential plant community produces about 1,800 pounds of air-dry vegetation in years of above-normal precipitation and 1,000 pounds in years of below-normal precipitation.

This soil is suitable for seeding to adapted grasses and forbs if the range is in poor condition. Seedbed preparation and planting on the contour or across the slope, where practical, conserve moisture and help to control water erosion. The surface layer is susceptible to water erosion and soil blowing if it is disturbed or if the range is overgrazed.

This soil is well suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian crabapple, green ash, Siberian elm, white willow, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and cotoneaster. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings.

The main limitations for homesite development on this soil are moderate permeability and potential frost action. If the soil is used for septic tank absorption fields, the moderate permeability can be overcome by increasing the size of the absorption field. Frost action can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome this limitation.

This map unit is in capability subclass IIIe, nonirrigated, and in Silty range site, 15- to 19-inch precipitation zone.

98—Farnuf loam, 4 to 8 percent slopes. This deep, well drained soil is on fans and terraces in the central and western parts of the county. It formed in alluvium. Slopes commonly are 250 to 1,000 feet long. Elevation is 3,500 to 4,000 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 120 days.

Included in this unit are small areas of deep Shambo soils on fans.

Typically, the surface layer of this Farnuf soil is grayish brown loam about 5 inches thick. The upper 7 inches of the subsoil is brown clay loam, and the lower 9 inches is

light brownish gray clay loam. The upper 18 inches of the substratum is light brownish gray loam, and the lower part to a depth of 64 inches or more is light yellowish brown clay loam.

Permeability is moderate. Available water capacity is high. Effective rooting depth is about 64 inches. The average annual wetting depth where this soil is under native vegetation is about 30 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

This soil is used for nonirrigated crops, mainly wheat, barley, oats, alfalfa, and grass for hay and pasture. It is also used as rangeland.

This soil is well suited to nonirrigated crops. It is limited mainly by low precipitation and the hazards of water erosion and soil blowing. Minimum tillage, contour cultivation, grassed waterways, stripcropping, and growing sod crops such as hay and pasture help to control soil blowing and water erosion.

The potential plant community on this soil is mainly bluebunch wheatgrass, green needlegrass, western wheatgrass, and needleandthread. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of western wheatgrass, needleandthread, Sandberg bluegrass, and blue grama increases. If excessive grazing continues, plants such as Kentucky bluegrass, timothy, clubmoss, and perennial weeds may invade. The potential plant community produces about 1,800 pounds of air-dry vegetation in years of above-normal precipitation and 1,000 pounds in years of below-normal precipitation.

Where clubmoss and blue grama are the dominant vegetation, pitting, furrowing, chiseling, or other mechanical treatment practices can be used to improve depleted rangeland. This soil is suitable for seeding to adapted grasses and forbs if the range is in poor condition. Seedbed preparation and planting on the contour or across the slope, where practical, conserve moisture and help to control water erosion. The surface layer is susceptible to water erosion and soil blowing if it is disturbed or if the range is overgrazed.

This soil is well suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian crabapple, green ash, Siberian elm, white willow, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and cotoneaster. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings. Planting on the contour helps to conserve moisture.

The main limitations for homesite development on this soil are moderate permeability and potential frost action. If the soil is used for septic tank absorption fields, the moderate permeability can be overcome by increasing the size of the absorption field. Frost action can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome this limitation.

This map unit is in capability subclass IIIe, nonirrigated, and in Silty range site, 15- to 19-inch precipitation zone.

99—Farnuf loam, 8 to 15 percent slopes. This deep, well drained soil is on fans and foot slopes in the central and western parts of the county. It formed in alluvium. Slopes commonly are 250 to 1,000 feet long. Elevation is 3,500 to 4,500 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 120 days.

Included in this unit are small areas of deep Shambo soils on convex slopes and small areas of moderately deep Reeder soils on uplands.

Typically, the surface layer of this Farnuf soil is grayish brown loam about 5 inches thick. The upper 7 inches of the subsoil is brown clay loam, and the lower 9 inches is light brownish gray clay loam. The upper 18 inches of the substratum is light brownish gray loam, and the lower part to a depth of 64 inches or more is light yellowish brown clay loam.

Permeability is moderate. Available water capacity is high. Effective rooting depth is about 64 inches. The average annual wetting depth where this soil is under native vegetation is about 30 inches. Runoff is medium, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

This soil is used mainly for hay and pasture and as rangeland. It is also used for nonirrigated crops such as wheat, barley, and oats.

This soil is suited to nonirrigated crops. It is limited mainly by the hazards of water erosion and soil blowing. Minimum tillage, contour cultivation, grassed waterways, stripcropping, and growing sod crops such as hay and pasture help to control soil blowing and water erosion.

The potential plant community on this soil is mainly bluebunch wheatgrass, green needlegrass, western wheatgrass, and needleandthread. If the range is excessively grazed, the proportion of some of these plants decreases and the proportion of western wheatgrass, needleandthread, Sandberg bluegrass, and blue grama increases. If excessive grazing continues, plants such as Kentucky bluegrass, timothy, clubmoss, and perennial weeds may invade. The potential plant community produces about 1,800 pounds of air-dry vegetation in years of above-normal precipitation and 1,000 pounds in years of below-normal precipitation.

This soil is suitable for seeding to adapted grasses and forbs if the range is in poor condition. Seedbed preparation and planting on the contour or across the slope, where practical, conserve moisture and help to control water erosion. The surface layer is susceptible to water erosion and soil blowing if it is disturbed or if the range is overgrazed.

This soil is well suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian crabapple, green ash, Siberian elm, white willow, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and cotoneaster. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings. Planting on the contour helps to conserve moisture.

The main limitations for homesite development on this soil are moderate permeability and potential frost action. If the soil is used for septic tank absorption fields, the moderate permeability can be overcome by increasing the size of the absorption field. Slope is a concern in installing septic tank absorption fields. Absorption lines should be installed on the contour. Frost action can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome this limitation.

This map unit is in capability subclass IVe, nonirrigated, and in Silty range site, 15- to 19-inch precipitation zone.

100—Fergus clay loam, 0 to 2 percent slopes. This deep, well drained soil is on terraces and fans. It formed in alluvium. Slopes commonly are more than 1,000 feet long. Elevation is 3,600 to 4,500 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 120 days.

Included in this unit are small areas of deep Terrad soils in concave areas and deep Twin Creek soils in the higher lying areas on fans.

Typically, the surface layer of this Fergus soil is brown clay loam about 6 inches thick. The upper 2 inches of the subsoil is reddish brown clay loam, the next 13 inches is reddish brown clay, and the lower 5 inches is brown clay loam. The substratum to a depth of 60 inches or more is reddish brown and light brown silty clay loam.

Permeability is moderately slow. Available water capacity is high. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is about 28 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

This soil is used mainly for nonirrigated crops such as wheat, barley, and oats. It is also used for hay and pasture and as rangeland.

This soil is well suited to nonirrigated crops. It is limited mainly by low precipitation and the hazard of soil blowing. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, stubble-mulch tillage, and growing sod crops such as hay and pasture help to control soil blowing.

The potential plant community on this soil is mainly bluebunch wheatgrass, green needlegrass, western wheatgrass, and Idaho fescue. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of Idaho fescue, plains reedgrass, Sandberg bluegrass, and blue grama increases. If excessive grazing continues, plants such as broom snakeweed, Kentucky bluegrass, perennial weeds, and annuals may invade. The potential plant community produces about 2,400 pounds of air-dry vegetation in years of above-normal precipitation and 1,800 pounds in years of below-normal precipitation.

This soil is suitable for seeding to adapted grasses and forbs if the range is in poor condition. The surface layer is susceptible to soil blowing if it is disturbed or if the range is overgrazed.

This soil is well suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian crabapple, green ash, Siberian elm, white willow, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and cotoneaster. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings.

The main limitations for homesite development on this soil are moderately slow permeability, shrink-swell potential, potential frost action, and low soil strength. If the soil is used for septic tank absorption fields, the moderately slow permeability can be overcome by increasing the size of the absorption field. Shrinking and swelling, frost action, and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential.

This map unit is in capability subclasses IIIe, nonirrigated. It is in Clayey range site, 15- to 19-inch precipitation zone.

101—Fergus clay loam, 2 to 8 percent slopes. This deep, well drained soil is on fans and terraces in the central part of the county. It formed in alluvium. Slopes commonly are 250 to 1,000 feet long. Elevation is 3,600 to 4,500 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 120 days.

Included in this unit are small areas of deep Twin Creek soils in the higher lying areas on some fans.

Typically, the surface layer of this Fergus soil is brown clay loam about 6 inches thick. The upper 2 inches of the subsoil is reddish brown clay loam, the next 13 inches is reddish brown clay, and the lower 5 inches is brown clay loam. The substratum to a depth of 60 inches or more is reddish brown and light brown silty clay loam.

Permeability is moderately slow. Available water capacity is high. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is about 28 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

This soil is used mainly for nonirrigated crops such as wheat, barley, and oats. It is also used for hay and pasture and as rangeland.

This soil is limited for nonirrigated crops mainly by low precipitation and the hazards of soil blowing and water erosion. Minimum tillage, contour cultivation, grassed waterways, stubble-mulch tillage, and growing sod crops such as hay and pasture help to control soil blowing and water erosion.

The potential plant community on this soil is mainly bluebunch wheatgrass, green needlegrass, western wheatgrass, and Idaho fescue. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of Idaho fescue, plains reedgrass, Sandberg bluegrass, and blue grama increases. If excessive grazing continues, plants such as broom snakeweed, Kentucky bluegrass, perennial weeds, and annuals may invade. The potential plant community produces about 2,400 pounds of air-dry vegetation in years of above-normal precipitation and 1,800 pounds in years of below-normal precipitation.

This soil is suitable for seeding to adapted grasses and forbs if the range is in poor condition. Seedbed preparation and planting on the contour or across the slope, where practical, conserve moisture and help to control water erosion. The surface layer is susceptible to water erosion and soil blowing if it is disturbed or if the range is overgrazed.

This soil is well suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian crabapple, green ash, Siberian elm, white willow, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and cotoneaster. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings.

The main limitations for homesite development on this soil are moderately slow permeability, shrink-swell potential, potential frost action, and low soil strength. If the soil is used for septic tank absorption fields, the moderately slow permeability can be overcome by increasing the size of the absorption field. Shrinking and swelling, frost action, and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential.

This map unit is in capability subclasses IIIe, nonirrigated. It is in Clayey range site, 15- to 19-inch precipitation zone.

102—Firada-Sheege-Rock outcrop complex, 25 to 60 percent slopes. This map unit is on uplands and mountains in the southern part of the county. Slopes commonly are 250 to 1,000 feet long. Elevation is 4,800 to 8,500 feet. The average annual precipitation is about 22 inches, the average annual air temperature is about 40 degrees F, and the average frost-free period is about 60 days.

This unit is about 35 percent Firada cobbly clay loam, 25 percent Sheege stony loam, and 25 percent Rock outcrop. The Firada soil is in plane and convex areas on mountainsides, the Sheege soil is on mountaintops and in convex areas on mountainsides, and Rock outcrop is on ridgetops and cliffs on mountainsides.

Included in this unit are small areas of deep Whitore soils and moderately deep Skaggs soils. The Whitore soils formed under forest vegetation, and the Skaggs soils formed under grassland vegetation. Also included are small areas of talus below Rock outcrop on ridges. Included areas make up about 15 percent of the total acreage.

The Firada soil is moderately deep and well drained. It formed in residuum and colluvium derived dominantly from fractured hard limestone. Typically, the surface is covered by a mat of forest litter consisting of needles and twigs about 1 1/2 inch thick. The surface layer is light gray cobbly clay loam about 3 inches thick. The subsoil is brown and pale brown very cobbly clay loam about 14 inches thick. The substratum is light brownish gray extremely flaggy clay loam about 8 inches thick. Limestone is at a depth of 25 inches. Depth to limestone ranges from 20 to 40 inches.

Permeability of the Firada soil is moderate. Available water capacity is very low. Effective rooting depth is 20 to 40 inches. The average annual wetting depth where this soil is under native vegetation is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

The Sheege soil is shallow and well drained. It formed in residuum derived dominantly from fractured hard limestone. Typically, the surface layer is dark gray stony loam about 6 inches thick. The underlying material is pale brown very channery loam about 6 inches thick. Limestone is at a depth of about 12 inches. Depth to limestone ranges from 10 to 20 inches.

Permeability of the Sheege soil is moderate. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. The average annual wetting depth where this soil is under native vegetation is 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is slight.

Rock outcrop is ledges and escarpments of limestone.

The soils in this unit are used as rangeland.

These soils are poorly suited to crops and to hay and pasture because of steepness of slope and rough topography.

The potential plant community on the Sheege soil is mainly bluebunch wheatgrass, western wheatgrass, bearded wheatgrass, and Columbia needlegrass. If the range is excessively grazed, the proportion of these plants decreases and the proportion of Idaho fescue, big sagebrush, Sandberg bluegrass, and eriogonum increases. If excessive grazing continues, plants such as broom snakeweed, perennial forbs, and annuals may invade. The potential plant community produces about 1,200 pounds of air-dry vegetation in years of above-normal precipitation and 700 pounds in years of below-normal precipitation.

The Firada soil is forested. It is poorly suited to livestock grazing. The potential native understory vegetation is dominated by Oregon-grape, white spirea, common snowberry, blue huckleberry, heartleaf arnica, twinflower, northern bedstraw, common pipsissewa, feather solomonseal, and clematis. The understory provides limited amounts of forage for livestock. Steepness of slope adversely affects the distribution and management of livestock.

The Firada soil is suited to the production of Douglas-fir and white spruce. The site index is about 36 for Douglas-fir and 27 for white spruce. At the culmination of the mean annual increment (CMAI), the Firada soil can produce 45 cubic feet, or 140 board feet, of Douglas-fir and 40 cubic feet, or 120 board feet (Scribner rule), of white spruce per acre per year. Potential production is estimated for an even-aged, fully stocked stand of trees.

The hazard of erosion is moderate, equipment limitations are moderate, seedling mortality is slight, plant competition is severe, and the hazard of windthrow is moderate.

The main limitations of the Firada soil for management of timber are steepness of slope, depth to bedrock, and very low available water capacity. Where slopes are 45 to 60 percent, the kind of equipment that can be used effectively is limited. Line skidding of logs should be considered for the steeper slopes. Competition from understory vegetation and very low available water capacity make establishment of tree seedlings difficult. Minimizing the risk of erosion while harvesting timber is essential. Where slopes are 25 to 60 percent, maintaining adequate plant cover on the disturbed areas and using sediment filter strips of undisturbed vegetation along streams reduce soil erosion and problems of water quality.

Rock outcrop and the nature of the Firada soil make harvesting of timber and other forest management practices very difficult. This unit is not suited to road construction.

The soils in this unit are poorly suited to homesite development because of steepness of slope and the moderate and shallow depth to limestone.

This map unit is in capability subclass VIIe, nonirrigated. The Sheege soil is in Shallow range site, 20- to 24-inch precipitation zone, and the Firada soil is in woodland suitability group 6f1.

103—Flasher-Tally-Rock outcrop complex, 25 to 45 percent slopes. This map unit is on uplands in the northwestern part of the county (fig. 5). Slopes commonly are 250 to 1,000 feet long. Elevation is 3,400 to 4,500 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 120 days.

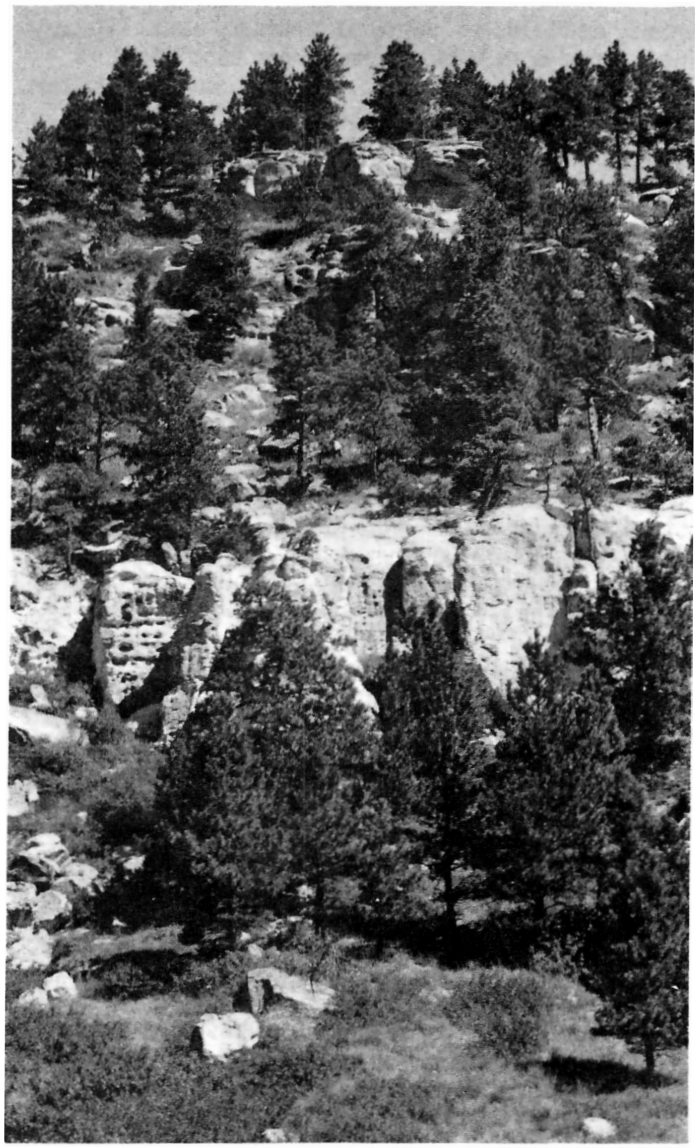

Figure 5.—Typical area of Flasher-Tally-Rock outcrop complex, 25 to 45 percent slopes, along the Judith River Breaks.

This unit is about 30 percent Flasher loamy fine sand, 30 percent Tally sandy loam, and 25 percent Rock outcrop. The Flasher soil is in convex areas above rock ledges, and the Tally soil is on foot slopes below the rock ledges. Rock outcrop consists of sandstone ledges.

Included in this unit are small areas of shallow Cabba and Wayden soils and moderately deep Doney soils on convex side slopes. Also included are small areas of Flasher and Tally soils that have slopes of more than 45 percent and areas of Rock outcrop. Included areas make up about 15 percent of the total acreage.

The Flasher soil is shallow and somewhat excessively drained. It formed in residuum derived dominantly from weakly consolidated, sandy sedimentary beds. Typically, the surface layer is brown loamy fine sand about 11 inches thick. The underlying material is very pale brown loamy fine sand about 5 inches thick. Pale yellow sedimentary beds are at a depth of about 16 inches. Depth to sedimentary beds ranges from 10 to 20 inches.

Permeability of the Flasher soil is rapid. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. The average annual wetting depth where this soil is under native vegetation is 10 to 20 inches. Runoff is medium, and the hazard of water erosion is high. The hazard of soil blowing is high.

The Tally soil is deep and well drained. It formed in alluvium derived dominantly from sandstone. Typically, the surface layer is brown sandy loam about 6 inches thick. The subsoil is brown and pale brown fine sandy loam about 26 inches thick. The substratum to a depth of 60 inches or more is very pale brown loamy fine sand.

Permeability of the Tally soil is moderately rapid to a depth of 32 inches and rapid below that depth. Available water capacity is moderate. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is about 36 inches. Runoff is medium, and the hazard of water erosion is high. The hazard of soil blowing is high.

Rock outcrop consists of exposures of sandstone on ledges and escarpments.

The soils in this unit are used as rangeland.

These soils are poorly suited to cultivated crops and to hay and pasture because of steepness of slope and rough topography.

The potential plant community on the Flasher soil is mainly prairie sandreed, western wheatgrass, little bluestem, and plains muhly. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, threadleaf sedge, blue grama, and fringed sagewort increases. If excessive grazing continues, plants such as red threeawn, annuals, and perennial weeds may invade. The potential plant community produces about 1,500 pounds of air-dry vegetation in years of above-normal precipitation and 1,000 pounds in years of below-normal precipitation.

The potential plant community on the Tally soil is mainly prairie sandreed, needleandthread, western wheatgrass, and little bluestem. If the range is excessively grazed, the proportion of some of these plants decreases and the proportion of needleandthread, sand dropseed, blue grama, and western wheatgrass increases. If excessive grazing continues, plants such as horseweed fleabane, needleleaf sedge, red threeawn, and perennial weeds may invade. The potential plant community produces about 1,600 pounds of air-dry vegetation in years of above-normal precipitation and 1,200 pounds in years of below-normal precipitation.

The surface layer is susceptible to water erosion and soil blowing if it is disturbed or if the range is overgrazed. These soils are not suited to mechanical treatment because of slope and rough topography.

These soils are not suited to windbreaks. They are limited mainly by slope.

The soils in this unit are poorly suited to homesite development because of the steepness of slope.

This map unit is in capability subclass VIIe, nonirrigated. The Flasher soil is in Shallow range site, 15- to 19-inch precipitation zone, and the Tally soil is in Sandy range site, 15- to 19-inch precipitation zone.

104—Floweree silt loam, 2 to 8 percent slopes. This deep, well drained soil is on fans and terraces in the northern part of the county. It formed in alluvial and eolian material. Slopes commonly are 250 to 1,000 feet long. Elevation is 3,000 to 3,800 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 44 degrees F, and the average frost-free period is about 130 days.

Included in this unit are small areas of deep Ethridge soils on concave slopes.

Typically, the surface layer of this Floweree soil is grayish brown silt loam about 7 inches thick. The subsoil is grayish brown silt loam about 29 inches thick. The upper 9 inches of the substratum is light olive brown silt loam, and the lower part to a depth of 60 inches or more is light olive brown silt loam stratified with very fine sandy loam.

Permeability is moderately slow. Available water capacity is high. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is about 24 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

This soil is used for nonirrigated crops, mainly wheat, barley, oats, alfalfa, and grass for hay and pasture. It is also used as rangeland.

This soil is well suited to nonirrigated crops. It is limited mainly by low precipitation and the hazards of water erosion and soil blowing. Because precipitation is not sufficient for annual cropping, a cropping system that includes small grains and summer fallow is best. Minimum tillage, contour cultivation, grassed waterways,

stripcropping, and growing sod crops such as hay and pasture help to control soil blowing and water erosion. Tall grass barriers trap snow, which increases the amount of moisture in the soil.

The potential plant community on this soil is mainly bluebunch wheatgrass, western wheatgrass, green needlegrass, and needleandthread. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of needleandthread, blue grama, prairie junegrass, and fringed sagewort increases. If excessive grazing continues, plants such as pricklypear, perennial weeds, annuals, and clubmoss may invade. The potential plant community produces about 1,400 pounds of air-dry vegetation in years of above-normal precipitation and 800 pounds in years of below-normal precipitation.

This soil is suitable for seeding to adapted grasses and forbs if the range is in poor condition. Seedbed preparation and planting on the contour or across the slope, where practical, conserve moisture and help to control water erosion. The surface layer is susceptible to water erosion and soil blowing if it is disturbed or if the range is overgrazed.

This soil is well suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian crabapple, green ash, Siberian elm, white willow, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and cotoneaster. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings.

The main limitations for homesite development on this soil are moderately slow permeability, shrink-swell potential, potential frost action, and low soil strength. If the soil is used for septic tank absorption fields, the moderately slow permeability can be overcome by increasing the size of the absorption field. Shrinking and swelling, frost action, and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential.

This map unit is in capability subclass IIIe, nonirrigated, and in Silty range site, 10- to 14-inch precipitation zone.

105—Fluvaquentic Haplaquolls, nearly level. These deep, poorly drained soils are on flood plains in the western and southern parts of the county. They formed in alluvium. Slope is 0 to 2 percent. Slopes commonly are 250 to 1,000 feet long. Elevation is 2,700 to 4,700 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 120 days.

Included in this unit are small areas of well drained soils on fans.

These dark grayish brown soils range from loam to clay throughout. In some areas these soils have a very gravelly or extremely gravelly substratum below a depth of 20 inches.

Permeability of Fluvaquentic Haplaquolls is variable, ranging from slow to moderate. Available water capacity is moderate to high. Effective rooting depth is limited by a seasonal high water table that is at a depth of 1 foot to 3 feet from spring to early in summer. The average annual wetting depth where these soils are under native vegetation is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight except during periods of occasional flooding. The hazard of soil blowing is slight.

These soils are used as rangeland. They are poorly suited to crops and to hay and pasture because of wetness and the hazard of flooding.

The potential plant community on these soils is mainly tall sedges, American mannagrass, slender wheatgrass, and prairie cordgrass. If the range is excessively grazed, the proportion of these plants decreases and the proportion of mat muhly, sedges, Baltic rush, and western wheatgrass increases. If excessive grazing continues, plants such as Kentucky bluegrass, timothy, and annuals may invade. The potential plant community produces about 5,500 pounds of air-dry vegetation in years of above-normal precipitation and 4,000 pounds in years of below-normal precipitation.

Mechanical treatment is limited on these soils because of susceptibility to flooding and the hazard of water erosion during floods. Grazing should be delayed until the soils have dried sufficiently and are firm enough to withstand trampling by livestock.

These soils are poorly suited to windbreaks because of the seasonal high water table, which is at a depth of 12 to 36 inches during most of the growing season.

The hazard of occasional flooding and the seasonal high water table make homesite development on these soils impractical.

This map unit is in capability subclass Vw, nonirrigated, and in Subirrigated range site, 15- to 19-inch precipitation zone.

106—Frazer silty clay loam. This deep, well drained soil is on flood plains in the southern and western parts of the county. It formed in alluvium derived from mixed rock sources. Slope is 0 to 2 percent. Slopes commonly are more than 1,000 feet long. Elevation is 3,000 to 4,000 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 120 days.

Included in this unit are small areas of deep Korchea soils. Also included are small areas of Frazer soils that have a loam and silty clay surface layer.

Typically, the surface layer of this Frazer soil is grayish brown silty clay loam about 6 inches thick. The upper 16 inches of the underlying material is grayish brown silty clay loam, the next 12 inches is grayish brown silty clay, and the lower part to a depth of 60 inches or more is grayish brown silty clay loam.

Permeability is slow. Available water capacity is high. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is about 22 inches. Runoff is slow, and the hazard of water erosion is slight except during rare periods of flooding. The hazard of soil blowing is moderate.

This soil is used mainly for hay and pasture. It is also used as rangeland and for nonirrigated crops such as wheat, barley, and oats.

This soil is well suited to nonirrigated crops. It is limited mainly by the hazards of soil blowing and flooding. Soil blowing can be reduced by returning crop residue to the soil and practicing minimum tillage. Growing sod crops such as hay and pasture also helps to control soil blowing and reduces water erosion during floods.

The potential plant community on this soil is mainly western wheatgrass, green needlegrass, slender wheatgrass, and basin wildrye. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of western wheatgrass, prairie junegrass, needleandthread, and silver sagebrush increases. If excessive grazing continues, plants such as Kentucky bluegrass, clubmoss, pricklypear, and curlycup gumweed may invade. The potential plant community produces about 3,000 pounds of air-dry vegetation in years of above-normal precipitation and 1,400 pounds in years of below-normal precipitation.

This soil is suitable for seeding to adapted grasses and forbs if the range is in poor condition. The surface layer is susceptible to water erosion during times of flooding and to soil blowing if it is disturbed or if the range is overgrazed.

This soil is well suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian crabapple, green ash, Siberian elm, white willow, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and cotoneaster. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings.

The hazards of flooding and of streams changing channels make homesite development on this soil impractical.

This map unit is in capability subclass IIIe, nonirrigated, and in Clayey range site, 15- to 19-inch precipitation zone.

107—Gerber clay loam, 0 to 2 percent slopes. This deep, well drained soil is on terraces in the western part of the county. It formed in alluvium derived dominantly from shale. Slopes commonly are more than 1,000 feet long. Elevation is 3,500 to 4,200 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 120 days.

Included in this unit are small areas of soils that are similar to this Gerber soil but have a silty clay surface layer.

Typically, the surface layer of this Gerber soil is grayish brown clay loam about 5 inches thick. The upper 15 inches of the subsoil is yellowish brown and grayish brown silty clay, and the lower 10 inches is pale brown silty clay. The substratum to a depth of 60 inches or more is light brownish gray silty clay.

Permeability is slow. Available water capacity is high. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is about 26 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

This soil is used for nonirrigated crops, mainly wheat, barley, and oats, for hay and pasture, and as rangeland.

This soil is well suited to nonirrigated crops. It is limited mainly by low precipitation and the hazard of soil blowing. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, stubble-mulch tillage, and growing sod crops such as hay and pasture help to control soil blowing.

The potential plant community on this soil is mainly bluebunch wheatgrass, green needlegrass, western wheatgrass, and Idaho fescue. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of Idaho fescue, plains reedgrass, Sandberg bluegrass, and blue grama increases. If excessive grazing continues, plants such as broom snakeweed, Kentucky bluegrass, perennial weeds, and annuals may invade. The potential plant community produces about 2,300 pounds of air-dry vegetation in years of above-normal precipitation and 1,600 pounds in years of below-normal precipitation.

This soil is suitable for seeding to adapted grasses and forbs if the range is in poor condition. The surface layer is susceptible to soil blowing if it is disturbed or if the range is overgrazed.

This soil is well suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian crabapple, green ash, Siberian elm, white willow, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and cotoneaster. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings.

This soil is poorly suited to homesite development. The main limitations are slow permeability, shrink-swell potential, and low soil strength. If the soil is used for septic tank absorption fields, the slow permeability can be overcome by increasing the size of the absorption field. Shrinking and swelling and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential.

This map unit is in capability subclass IIIe, nonirrigated, and in Clayey range site, 15- to 19-inch precipitation zone.

108—Gerber clay loam, 2 to 4 percent slopes. This deep, well drained soil is on fans and terraces in the western part of the county. It formed in alluvium derived dominantly from shale. Slopes commonly are 250 to 1,000 feet long. Elevation is 3,500 to 4,200 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 120 days.

Included in this unit are small areas of soils that are similar to this Gerber soil but have a silty clay surface layer.

Typically, the surface layer of this Gerber soil is grayish brown clay loam about 5 inches thick. The upper 15 inches of the subsoil is yellowish brown and grayish brown silty clay, and the lower 10 inches is pale brown silty clay. The substratum to a depth of 60 inches or more is light brownish gray silty clay.

Permeability is slow. Available water capacity is high. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is about 26 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

This soil is used for nonirrigated crops, mainly wheat, barley, and oats, for hay and pasture, and as rangeland.

This soil is well suited to nonirrigated crops. It is limited mainly by low precipitation and the hazards of soil blowing and water erosion. Minimum tillage, contour cultivation, grassed waterways, stripcropping, and growing sod crops such as hay and pasture help to control soil blowing and water erosion.

The potential plant community on this soil is mainly bluebunch wheatgrass, green needlegrass, western wheatgrass, and Idaho fescue. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of Idaho fescue, plains reedgrass, Sandberg bluegrass, and blue grama increases. If excessive grazing continues, plants such as broom snakeweed, Kentucky bluegrass, perennial weeds, and annuals may invade. The potential plant community produces about 2,300 pounds of air-dry vegetation in years of above-normal precipitation and 1,600 pounds in years of below-normal precipitation.

This soil is suitable for seeding to adapted grasses and forbs if the range is in poor condition. Seedbed preparation and planting on the contour or across the slope, where practical, conserve moisture and help to control water erosion. The surface layer is susceptible to water erosion and soil blowing if it is disturbed or if the range is overgrazed.

This soil is well suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian crabapple, green ash, Siberian elm, white willow, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and cotoneaster. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings.

The main limitations for homesite development on this soil are slow permeability, shrink-swell potential, and low soil strength. If the soil is used for septic tank absorption fields, the slow permeability can be overcome by increasing the size of the absorption field. Shrinking and swelling and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential.

This map unit is in capability subclass IIIe, nonirrigated, and in Clayey range site, 15- to 19-inch precipitation zone.

109—Gerber silty clay, 0 to 4 percent slopes. This deep, well drained soil is fans and terraces in the western and central parts of the county. It formed in alluvium derived dominantly from shale. Slopes commonly are 250 to 1,000 feet long. Elevation is 3,500 to 4,200 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 120 days.

Included in this unit are small areas of soils that are similar to this Gerber soil but have a silty clay loam surface layer and are in concave areas.

Typically, the surface layer of this Gerber soil is grayish brown silty clay about 5 inches thick. The upper 15 inches of the subsoil is yellowish brown and grayish brown silty clay, and the lower 10 inches is pale brown silty clay. The substratum to a depth of 60 inches or more is light brownish gray silty clay.

Permeability is slow. Available water capacity is high. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is about 26 inches. Runoff is medium,

and the hazard of water erosion is moderate. The hazard of soil blowing is high.

This soil is used for nonirrigated crops, mainly wheat, barley, and oats, for hay and pasture, and as rangeland.

This soil is well suited to nonirrigated crops. It is limited mainly by low precipitation and the hazards of soil blowing and water erosion. Minimum tillage, contour cultivation, stripcropping, tall grass barriers, grassed waterways, returning crop residue to the soil, and growing sod crops such as hay and pasture help to control soil blowing and water erosion. Tall grass barriers also reduce evaporation and trap snow, which increases the amount of moisture in the soil. Returning crop residue to the soil also helps to maintain good tilth. Chiseling through stubble in fall on the contour or across the slope helps to control water erosion.

The potential plant community on this soil is mainly bluebunch wheatgrass, green needlegrass, western wheatgrass, and Idaho fescue. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of Idaho fescue, plains reedgrass, Sandberg bluegrass, and blue grama increases. If excessive grazing continues, plants such as broom snakeweed, Kentucky bluegrass, perennial weeds, and annuals may invade. The potential plant community produces about 2,300 pounds of air-dry vegetation in years of above-normal precipitation and 1,600 pounds in years of below-normal precipitation.

This soil is suitable for seeding to adapted grasses and forbs if the range is in poor condition. Seedbed preparation and planting on the contour or across the slope, where practical, conserve moisture and help to control water erosion. The surface layer is susceptible to water erosion and soil blowing if it is disturbed or if the range is overgrazed.

This soil is well suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian crabapple, green ash, Siberian elm, white willow, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and cotoneaster. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings.

The main limitations for homesite development on this soil are slow permeability, shrink-swell potential, and low soil strength. If the soil is used for septic tank absorption fields, the slow permeability can be overcome by increasing the size of the absorption field. Shrinking and swelling and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential.

This map unit is in capability subclass IIIe, nonirrigated, and in Clayey range site, 15- to 19-inch precipitation zone.

110—Gerber-Winifred clay loams, 2 to 8 percent slopes. This map unit is on uplands in the central and western parts of the county. Slopes commonly are 250 to 1,000 feet long. Elevation is 3,500 to 4,200 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 120 days.

This unit is about 60 percent Gerber clay loam and 30 percent Winifred clay loam. The Gerber soil is on foot slopes and fans, and the Winifred soil is in convex areas on uplands.

Included in this unit is about 10 percent deep Fairfield soils on terrace remnants.

The Gerber soil is deep and well drained. It formed in alluvium derived dominantly from shale. Typically, the surface layer is grayish brown clay loam about 5 inches thick. The upper 15 inches of the subsoil is yellowish brown and grayish brown silty clay, and the lower 10 inches is pale brown silty clay. The substratum to a depth of 60 inches or more is light brownish gray silty clay.

Permeability of the Gerber soil is slow. Available water capacity is high. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is about 26 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

The Winifred soil is moderately deep and well drained. It formed in alluvium and residuum derived dominantly from semiconsolidated shale. Typically, the surface layer is dark grayish brown clay loam about 6 inches thick. The subsoil is grayish brown silty clay and clay about 26 inches thick. Light brownish gray and yellowish brown shale is at a depth of about 32 inches. Depth to shale ranges from 20 to 40 inches.

Permeability of the Winifred soil is slow. Available water capacity is moderate to low. Effective rooting depth is about 20 to 40 inches. The average annual wetting depth where this soil is under native vegetation is 20 to 26 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

The soils in this unit are used for nonirrigated crops, mainly wheat, barley, oats, alfalfa, and grass for hay and pasture. They are also used as rangeland.

These soils are well suited to nonirrigated crops. They are limited mainly by low precipitation and the hazards of water erosion and soil blowing. Minimum tillage, contour cultivation, grassed waterways, stubble-mulch tillage, and growing sod crops such as hay and pasture help to control soil blowing, runoff, and water erosion.

The potential plant community on these soils is mainly bluebunch wheatgrass, green needlegrass, western

wheatgrass, and Idaho fescue. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of Idaho fescue, plains reedgrass, Sandberg bluegrass, and blue grama increases. If excessive grazing continues, plants such as broom snakeweed, Kentucky bluegrass, perennial weeds, and annuals may invade. The potential plant community produces about 2,300 pounds of air-dry vegetation in years of above-normal precipitation and 1,700 pounds in years of below-normal precipitation.

These soils are suitable for seeding to adapted grasses and forbs if the range is in poor condition. Seedbed preparation and planting on the contour or across the slope, where practical, conserve moisture and help to control water erosion. The surface layer is susceptible to water erosion and soil blowing if it is disturbed or the range is overgrazed.

The Gerber soil is well suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian crabapple, green ash, Siberian elm, white willow, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and cotoneaster.

The Winifred soil is suited to windbreaks, but the moderate to low available water capacity of the soil limits the growth of both trees and shrubs. Suitable trees for planting are Russian-olive, Siberian crabapple, green ash, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and cotoneaster.

Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings on these soils. Planting on the contour conserves moisture.

These soils are poorly suited to homesite development. The main limitations are slow permeability, moderate depth to shale in the Winifred soil, shrink-swell potential, and low soil strength. The soils are severely limited for septic tank absorption fields because of the slow permeability and the moderate depth to shale in the Winifred soil. Shrinking and swelling and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential.

This map unit is in capability subclass IIIe, nonirrigated, and in Clayey range site, 15- to 19-inch precipitation zone.

111—Gerdrum clay loam, 0 to 4 percent slopes. This deep, well drained soil is on terraces in the eastern part of the county. It formed in alluvium derived from mixed rock sources. Slopes commonly are 250 to 1,000 feet long. Elevation is 2,300 to 3,800 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 44 degrees F, and the average frost-free period is about 130 days.

Included in this unit are small areas of deep Creed and Absher soils. The Absher soils are salt- and alkali-affected, have a crusty surface layer, and are nearly barren of vegetation.

Typically, the surface layer of this Gerdrum soil is pale brown loam about 1 1/2 inches thick. The subsurface is light gray clay loam about 2 inches thick. The subsoil is grayish brown clay about 23 1/2 inches thick. The substratum to a depth of 60 inches or more is olive gray and pale yellow silty clay.

Permeability is slow. Available water capacity is moderate. This soil is salt- and alkali-affected in the subsoil and substratum. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is about 22 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

This soil is used mainly as rangeland. It is also used for hay and pasture and for nonirrigated crops such as wheat, barley, and oats.

This soil is suited to nonirrigated crops. It is limited mainly by low precipitation, the content of salts and alkali in the subsoil, and the hazard of soil blowing. Crops that are tolerant of drought are most suitable because the available moisture is not adequate for good growth of most other plants. Subsoiling improves water infiltration and allows salts to be leached downward. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, stubble-mulch tillage, and growing sod crops such as hay and pasture help to control soil blowing.

The potential plant community on this soil is mainly western wheatgrass, thickspike wheatgrass, green needlegrass, and prairie junegrass. If the range is excessively grazed, the proportion of these plants decreases and the proportion of plains reedgrass, blue grama, Sandberg bluegrass, and big sagebrush increases. If excessive grazing continues, plants such as broom snakeweed, pricklypear, clubmoss, and annuals may invade. The potential plant community produces about 800 pounds of air-dry vegetation in years of above-normal precipitation and 400 pounds in years of below-normal precipitation.

This soil is suitable for seeding to adapted grasses and forbs if the range is in poor condition. The surface layer is susceptible to soil blowing if it is disturbed or if the range is overgrazed.

This soil is suited to windbreaks, but it is moderately saline, which limits the choice of trees and shrubs to those that are salt tolerant. Suitable trees for planting are Russian-olive, black hawthorn, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, common chokecherry, skunkbush sumac, and silver buffaloberry. Summer

fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings.

The main limitations for homesite development on this soil are slow permeability, salinity, shrink-swell potential, corrosivity to concrete, and low soil strength. If the soil is used for septic tank absorption fields, the slow permeability can be overcome by increasing the size of the absorption field. Shrinking and swelling and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential. Use of salt-resistant concrete is necessary to overcome the corrosivity.

This map unit is in capability subclass IVs, nonirrigated, and in Dense Clay range site, 10- to 14-inch precipitation zone.

112—Gerdrum-Absher complex, 0 to 2 percent slopes. This map unit is on terraces in the eastern part of the county. Slopes commonly are more than 1,000 feet long. Elevation is 2,300 to 3,800 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 44 degrees F, and the average frost-free period is about 130 days.

This unit is about 55 percent Gerdrum clay loam and 30 percent Absher clay. The Gerdrum soil is in the higher-lying areas on the landscape and the Absher soil is in slightly depressional areas.

Included in this unit are small areas of deep Marvan and Vanda soils that are salt- and alkali-affected. The Vanda soils have a crusty surface layer. Also included are a few small areas of soils that are similar to the Gerdrum and Absher soils but have semiconsolidated shale at a depth of 40 to 60 inches and a few small areas of soils that have a gravelly surface layer. These included areas make up about 15 percent of this unit.

The Gerdrum soil is deep and well drained. It formed in alluvium derived from mixed rock sources. Typically, the surface layer is pale brown loam about 1 1/2 inches thick. The subsurface layer is light gray clay loam about 2 inches thick. The subsoil is grayish brown clay about 23 1/2 inches thick. The substratum to a depth of 60 inches or more is olive gray and pale yellow silty clay.

Permeability of the Gerdrum soil is slow. Available water capacity is moderate. This soil is salt- and alkali-affected in the subsoil and substratum. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is about 22 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

The Absher soil is deep and well drained. It formed in alluvium derived from mixed rock sources. Typically, the surface layer is light gray loam about 1 inch thick. The upper 7 inches of the subsoil is brown clay, and the lower 11 inches is grayish brown clay. The substratum to a depth of 60 inches or more is grayish brown clay.

Permeability of the Absher soil is very slow. Available water capacity is low. This soil is salt- and alkali-affected in the subsoil and substratum. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is about 22 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high.

The soils in this unit are used as rangeland.

These soils are poorly suited to cultivated crops and to hay and pasture because of the high content of salt and alkali in the subsoil and substratum.

The potential plant community on the Gerdrum soil is mainly western wheatgrass, thickspike wheatgrass, green needlegrass, and prairie junegrass. If the range is excessively grazed, the proportion of these plants decreases and the proportion of plains reedgrass, blue grama, Sandberg bluegrass, and big sagebrush increases. If excessive grazing continues, plants such as broom snakeweed, pricklypear, clubmoss, and annuals may invade. The potential plant community produces about 800 pounds of air-dry vegetation in years of above-normal precipitation and 400 pounds in years of below-normal precipitation.

The potential plant community on the Absher soil is mainly western wheatgrass, green needlegrass, Cusick bluegrass, and Nuttall saltbush. If the range is excessively grazed, the proportion of these plants decreases and the proportion of blue grama, Sandberg bluegrass, fringed sagewort, and big sagebrush increases. If excessive grazing continues, plants such as broom snakeweed, knotweed, pricklypear, and tumblegrass may invade. The potential plant community produces about 200 pounds of air-dry vegetation in years of above-normal precipitation and 75 pounds in years of below-normal precipitation.

The surface layer of these soils is susceptible to soil blowing if it is disturbed or the range is overgrazed.

The Gerdrum soil is suited to windbreaks, but it is moderately saline, which limits the choice of trees and shrubs to those that are salt tolerant. Suitable trees for planting are Russian-olive, black hawthorn, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, common chokecherry, skunkbush sumac, and silver buffaloberry. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings.

The Absher soil is poorly suited to windbreaks. It is limited mainly by clayey texture and the high content of salt and alkali.

The main limitations for homesite development on the soils in this unit are slow and very slow permeability, salinity, shrink-swell potential, corrosivity to concrete,

and low soil strength. If these soils are used for septic tank absorption fields, the slow and very slow permeability can be overcome by increasing the size of the absorption field. Shrinking and swelling and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential. Use of salt-resistant concrete is necessary to overcome the corrosivity.

This map unit is in capability subclass VIs, nonirrigated, and in Dense Clay range site, 10- to 14-inch precipitation zone.

113—Gerdrum-Absher complex, 2 to 8 percent slopes. This map unit is on fans in the eastern part of the county. Slopes commonly are 250 to 1,000 feet long. Elevation is 2,300 to 3,800 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 44 degrees F, and the average frost-free period is about 130 days.

This unit is about 60 percent Gerdrum clay loam and 25 percent Absher clay. The Absher soil is in small depressional areas surrounded by the Gerdrum soil.

Included in this unit are small areas of deep Creed soils that are salt- and alkali-affected. Also included are a few small areas of soils that are similar to the Gerdrum and Absher soils but have semiconsolidated shale at a depth of 40 to 60 inches and a few small areas of soils that have a gravelly surface layer. These included areas make up about 15 percent of this unit.

The Gerdrum soil is deep and well drained. It formed in alluvium derived from mixed rock sources. Typically, the surface layer is pale brown loam about 1 1/2 inches thick. The subsurface is light gray clay loam about 2 inches thick. The subsoil is grayish brown clay about 23 1/2 inches thick. The substratum to a depth of 60 inches or more is olive gray and pale yellow silty clay.

Permeability of the Gerdrum soil is slow. Available water capacity is moderate. This soil is salt- and alkali-affected in the subsoil and substratum. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is about 22 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

The Absher soil is deep and well drained. It formed in alluvium derived from mixed rock sources. Typically, the surface layer is light gray loam about 1 inch thick. The upper 7 inches of the subsoil is brown clay, and the lower 11 inches is grayish brown clay. The substratum to a depth of 60 inches or more is grayish brown clay.

Permeability of the Absher soil is very slow. Available water capacity is low. This soil is salt- and alkali-affected in the subsoil and substratum. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is about 22 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high.

The soils in this unit are used as rangeland.

These soils are poorly suited to cultivated crops and to hay and pasture because of the high content of salt and alkali in the subsoil and substratum.

The potential plant community on the Gerdrum soil is mainly western wheatgrass, thickspike wheatgrass, green needlegrass, and prairie junegrass. If the range is excessively grazed, the proportion of these plants decreases and the proportion of plains reedgrass, blue grama, Sandberg bluegrass, and big sagebrush increases. If excessive grazing continues, plants such as broom snakeweed, pricklypear, clubmoss, and annuals may invade. The potential plant community produces about 800 pounds of air-dry vegetation in years of above-normal precipitation and 400 pounds in years of below-normal precipitation.

The potential plant community on the Absher soil is mainly western wheatgrass, green needlegrass, Cusick bluegrass, and Nuttall saltbush. If the range is excessively grazed, the proportion of these plants decreases and the proportion of blue grama, Sandberg bluegrass, fringed sagewort, and big sagebrush increases. If excessive grazing continues, plants such as broom snakeweed, knotweed, pricklypear, and tumblegrass may invade. The potential plant community produces about 200 pounds of air-dry vegetation in years of above-normal precipitation and 75 pounds in years of below-normal precipitation.

The surface layer of these soils is susceptible to water erosion and soil blowing if it is disturbed or if the range is overgrazed.

The Gerdrum soil is suited to windbreaks, but it is moderately saline, which limits the choice of trees and shrubs to those that are salt tolerant. Suitable trees for planting are Russian-olive, black hawthorn, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, common chokecherry, skunkbush sumac, and silver buffaloberry. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings. Planting on the contour helps to conserve moisture.

The Absher soil is poorly suited to windbreaks. It is limited mainly by its clayey texture and high content of salt and alkali.

The main limitations for homesite development on the soils in this unit are slow and very slow permeability, salinity, shrink-swell potential, corrosivity to concrete, and low soil strength. If these soils are used for septic tank absorption fields, the slow and very slow permeability can be overcome by increasing the size of the absorption field. Shrinking and swelling and low soil

strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential. Use of salt-tolerant concrete is necessary to overcome the corrosivity.

This map unit is in capability subclass VIf, nonirrigated, and in Dense Clay range site, 10- to 14-inch precipitation zone.

114—Hanson very stony loam, 2 to 15 percent slopes. This deep, well drained soil is on fans and terraces in the south-central part of the county. It formed in alluvium and colluvium derived dominantly from limestone. Slopes commonly are 250 to 1,000 feet long. Elevation is 4,700 to 7,000 feet. The average annual precipitation is about 22 inches, the average annual air temperature is about 40 degrees F, and the average frost-free period is about 70 days.

Included in this unit are small areas of deep Raynesford soils.

Typically, the surface layer of this Hanson soil is very dark grayish brown very stony loam about 11 inches thick. The next layer is dark grayish brown cobbly clay loam about 4 inches thick. The underlying material to a depth of 62 inches or more is pale brown and very pale brown extremely gravelly clay loam.

Permeability is moderate. Available water capacity is moderate. Effective rooting depth is 62 inches or more. The average annual wetting depth where this soil is under native vegetation is 62 inches or more. Runoff is medium, and the hazard of water erosion is moderate to high. The hazard of soil blowing is slight.

This soil is used as rangeland.

This soil is poorly suited to cultivated crops and to hay and pasture because of large stones in the surface layer.

The potential plant community on this soil is mainly rough fescue, bluebunch wheatgrass, Columbia needlegrass, and mountain brome. If the range is excessively grazed, the proportion of these plants decreases and the proportion of Idaho fescue, western wheatgrass, Letterman needlegrass, and spikeoat increases. If excessive grazing continues, plants such as timothy, Kentucky bluegrass, onespike danthonia, and perennial forbs may invade. The potential plant community produces about 3,400 pounds of air-dry vegetation in years of above-normal precipitation and 2,600 pounds in years of below-normal precipitation.

The surface layer is susceptible to water erosion if it is disturbed or if the range is overgrazed. This soil is not suited to mechanical treatment because of the large stones in the surface layer. Maintaining a good plant cover on the soil helps to control water erosion.

This soil is poorly suited to windbreaks. It is limited mainly by stoniness.

The main limitation for homesite development on this soil is the content of rock fragments. Stones and cobbles need to be removed from the surface in areas used for lawns.

This map unit is in capability subclass VIs, nonirrigated, and in Silty range site, 20- to 24-inch precipitation zone.

115—Harlem silty clay loam. This deep, well drained soil is on low terraces and flood plains in the eastern part of the county. It formed in alluvium derived dominantly from mixed rock sources. Slope is 0 to 2 percent. Slopes commonly are more than 1,000 feet long. Elevation is 2,200 to 3,600 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 44 degrees F, and the average frost-free period is about 130 days.

Included in this unit are small areas of moderately well drained soils.

Typically, the surface layer of this Harlem soil is grayish brown silty clay loam about 8 inches thick. The upper 16 inches of the underlying material is grayish brown clay loam stratified with silty clay loam and silty clay, the next 28 inches is grayish brown silty clay loam stratified with silty clay and silt loam, and the lower part to a depth of 66 inches or more is grayish brown silty clay stratified with silty clay loam.

Permeability is slow. Available water capacity is high. Effective rooting depth is 66 inches or more. The average annual wetting depth where this soil is under native vegetation is about 22 inches. Runoff is slow, and the hazard of water erosion is slight except during periods of rare flooding. The hazard of soil blowing is slight.

This soil is used mainly for hay and pasture. It is also used as rangeland and for nonirrigated crops such as wheat, barley, and oats.

This soil is suited to nonirrigated crops. It is limited mainly by the hazard of flooding and low precipitation. Because precipitation is not sufficient for annual cropping, a cropping system that includes small grains and summer fallow is best. Crop residue left on or near the surface helps to conserve moisture, increases the water intake rate, and improves tilth. Tillage should be kept to a minimum. Sod crops such as hay and pasture also conserve moisture, increase the water intake rate, and help to control erosion during floods.

The potential plant community on this soil is mainly western wheatgrass, green needlegrass, needleandthread, and basin wildrye. If the range is excessively grazed, the proportion of some of these plants decreases and the proportion of needleandthread, western wheatgrass, plains reedgrass, and blue grama increases. If excessive grazing continues, plants such as curlycup gumweed, curly dock, foxtail barley, and

Kentucky bluegrass may invade. The potential plant community produces about 2,500 pounds of air-dry vegetation in years of above-normal precipitation and 1,200 pounds in years of below-normal precipitation.

This soil is suitable for seeding to adapted grasses and forbs if the range is in poor condition.

This soil is well suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian crabapple, green ash, Siberian elm, white willow, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and cotoneaster. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings.

The hazards of rare flooding and streams changing channels make homesite development on this soil impractical.

This map unit is in capability subclass IIIc, nonirrigated, and in Overflow range site, 10- to 14-inch precipitation zone.

116—Havre loam. This deep, well drained soil is on low terraces and flood plains in the eastern and northern parts of the county. It formed in alluvium derived from mixed rock sources. Slope is 0 to 2 percent. Slopes commonly are more than 1,000 feet long. Elevation is 2,200 to 3,600 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 44 degrees F, and the average frost-free period is about 130 days.

Included in this unit are small areas of soils that are similar to this Havre soil but have a fine sandy loam or silty clay loam surface layer and soils that have sand and gravel at a depth of 20 to 40 inches.

Typically, the surface layer of this Havre soil is grayish brown loam about 5 inches thick. The upper 13 inches of the underlying material is light brownish gray loam stratified with very fine sandy loam, and the lower part to a depth of 62 inches or more is light brownish gray loam stratified with fine sandy loam.

Permeability is moderate. Available water capacity is high. Effective rooting depth is 62 inches or more. The average annual wetting depth where this soil is under native vegetation is about 24 inches. Runoff is slow, and the hazard of water erosion is slight except during periods of rare flooding. The hazard of soil blowing is moderate.

This soil is used mainly for hay and pasture. It is also used as rangeland and for nonirrigated crops such as wheat, barley, and oats.

This soil is well suited to nonirrigated crops. It is limited mainly by low precipitation and the hazards of flooding and soil blowing. Because precipitation is not sufficient for annual cropping, a cropping system that includes small grains and summer fallow is best. Soil blowing can be reduced by returning crop residue to the soil and practicing minimum tillage. Sod crops such as hay and pasture also reduce soil blowing, and they help to control erosion during floods.

The potential plant community on this soil is mainly bluebunch wheatgrass, western wheatgrass, green needlegrass, and needleandthread. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of needleandthread, blue grama, prairie junegrass, and fringed sagewort increases. If excessive grazing continues, plants such as pricklypear, perennial weeds, annuals, and clubmoss may invade. The potential plant community produces about 1,500 pounds of air-dry vegetation in years of above-normal precipitation and 700 pounds in years of below-normal precipitation.

This soil is suitable for seeding to adapted grasses and forbs if the range is in poor condition. The surface layer is susceptible to water erosion during periods of flooding and to soil blowing if it is disturbed or if the range is overgrazed.

This soil is well suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian crabapple, green ash, Siberian elm, white willow, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and cotoneaster. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings.

The hazards of rare flooding and of streams changing channels make homesite development on this soil impractical.

This map unit is in capability subclass IIIe, nonirrigated, and in Silty range site, 10- to 14-inch precipitation zone.

117—Havre silty clay loam. This deep, well drained soil is on low terraces and flood plains in the eastern and northern parts of the county. It formed in alluvium derived from mixed rock sources. Slope is 0 to 2 percent. Slopes commonly are more than 1,000 feet long. Elevation is 2,200 to 3,600 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 44 degrees F, and the average frost-free period is about 130 days.

Included in this unit are a few small areas of deep Harlem soils in concave areas.

Typically, the surface layer of this Havre soil is grayish brown silty clay loam about 5 inches thick. The upper 13 inches of the underlying material is light brownish gray loam stratified with silty clay loam and fine sandy loam, and the lower part to a depth of 62 inches or more is light brownish gray loam stratified with fine sandy loam.

Permeability is moderate. Available water capacity is high. Effective rooting depth is 62 inches or more. The average annual wetting depth where this soil is under native vegetation is about 24 inches. Runoff is slow, and the hazard of water erosion is slight except during

periods of rare flooding. The hazard of soil blowing is moderate.

This soil is used mainly for hay and pasture. It is also used as rangeland and for nonirrigated crops such as wheat, barley, and oats.

This soil is well suited to nonirrigated crops. It is limited mainly by low precipitation and the hazards of flooding and soil blowing. Because precipitation is not sufficient for annual cropping, a cropping system that includes small grains and summer fallow is best. Crop residue left on or near the surface conserves moisture, increases the water intake rate, improves tilth, and helps to control soil blowing. Tillage should be kept to a minimum. Sod crops such as hay and pasture also reduce soil blowing, and they help to control erosion during floods.

The potential plant community on this soil is mainly western wheatgrass, green needlegrass, bluebunch wheatgrass, and thickspike wheatgrass. If the range is excessively grazed, the proportion of these plants decreases and the proportion of plains reedgrass, blue grama, Sandberg bluegrass, and fringed sagewort increases. If excessive grazing continues, plants such as perennial weeds, broom snakeweed, annuals, and clubmoss may invade. The potential plant community produces about 1,500 pounds of air-dry vegetation in years of above-normal precipitation and 900 pounds in years of below-normal precipitation.

This soil is suitable for seeding to adapted grasses and forbs if the range is in poor condition. The surface layer is susceptible to water erosion during periods of flooding and to soil blowing if it is disturbed or if the range is overgrazed.

This soil is well suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian crabapple, green ash, Siberian elm, white willow, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and cotoneaster. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings.

The hazards of rare flooding and of streams changing channels make homesite development on this soil impractical.

This map unit is in capability subclass IIIe, nonirrigated, and in Clayey range site, 10- to 14-inch precipitation zone.

118—Havre and Harlem soils, occasionally flooded. This map unit is on flood plains in the eastern and northern parts of the county. Slope is 0 to 2 percent. Slopes commonly are 250 to 1,000 feet long. Elevation is 2,200 to 3,600 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 44 degrees F, and the average frost-free period is about 130 days.

The proportion of each of these soils varies greatly from one area to another.

Included in this unit are small areas of deep Kobar and Yamac soils on fans.

The Havre soil is deep and well drained. It formed in alluvium derived from mixed rock sources. Typically, the surface layer is grayish brown loam about 5 inches thick. The upper 13 inches of the underlying material is light brownish gray loam stratified with very fine sandy loam, and the lower part to a depth of 62 inches or more is light brownish gray loam stratified with fine sandy loam.

Permeability of the Havre soil is moderate. Available water capacity is high. Effective rooting depth is 62 inches or more. The average annual wetting depth where this soil is under native vegetation is about 24 inches. Runoff is slow, and the hazard of water erosion is slight except during periods of occasional flooding. The hazard of soil blowing is moderate. This soil is subject to periods of flooding in spring and to flash flooding in summer.

The Harlem soil is deep and well drained. It formed in alluvium derived from mixed rock sources. Typically, the surface layer is grayish brown silty clay loam about 8 inches thick. The upper 16 inches of the underlying material is grayish brown clay loam stratified with silty clay loam and silty clay, the next 28 inches is grayish brown silty clay loam stratified with silty clay and silt loam, and the lower part to a depth of 66 inches or more is grayish brown silty clay stratified with silty clay loam.

Permeability of the Harlem soil is slow. Available water capacity is high. Effective rooting depth is 66 inches or more. The average annual wetting depth where this soil is under native vegetation is about 22 inches. Runoff is slow, and the hazard of water erosion is slight except during periods of occasional flooding. The hazard of soil blowing is slight. This soil is subject to periods of flooding in spring and to flash flooding in summer.

The soils in this unit are used as rangeland.

These soils are poorly suited to cultivated crops and to hay and pasture because of dissection by drainageways and the hazard of flooding.

The potential plant community on these soils is mainly western wheatgrass, green needlegrass, needleandthread, and basin wildrye. If the range is excessively grazed, the proportion of some of these plants decreases and the proportion of needleandthread, western wheatgrass, plains reedgrass, and blue grama increases. If excessive grazing continues, plants such as curlycup gumweed, curly dock, foxtail barley, and Kentucky bluegrass may invade. The potential plant community produces about 2,200 pounds of air-dry vegetation in years of above-normal precipitation and 1,100 pounds in years of below-normal precipitation.

The surface layer is susceptible to water erosion during floods and to soil blowing if it is disturbed or if the range is overgrazed. Mechanical treatment is limited because of dissection by drainageways, susceptibility to flooding, and the hazard of water erosion. Maintaining a

good plant cover on the soils helps to control erosion during floods and reduces soil blowing.

These soils are well suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian crabapple, green ash, Siberian elm, white willow, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and cotoneaster. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings.

The hazards of occasional flooding and of streams changing channel make homesite development on these soils impractical.

This map unit is in capability subclass VIw, nonirrigated, and in Overflow range site, 10- to 14-inch precipitation zone.

119—Hibar loam, 2 to 8 percent slopes. This moderately deep, well drained soil is on uplands in the south-central part of the county. It formed in residuum derived dominantly from fractured hard sandstone. Slopes commonly are 250 to 1,000 feet long. Elevation is 4,200 to 4,700 feet. The average annual precipitation is about 19 inches, the average annual air temperature is about 42 degrees F, and the average frost-free period is about 100 days.

Included in this unit are small areas of shallow Castner soils on knolls and ridges and deep Straw soils on fans.

Typically, the surface layer of this Hibar soil is dark grayish brown loam about 6 inches thick. The subsoil is brown loam about 16 inches thick. The substratum is very pale brown loam about 10 inches thick. Very pale brown sandstone is at a depth of about 32 inches. Depth to sandstone ranges from 20 to 40 inches.

Permeability is moderate. Available water capacity is low to moderate. Effective rooting depth is 20 to 40 inches. The average annual wetting depth where this soil is under native vegetation is 20 to 40 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

This soil is used for nonirrigated crops, mainly wheat, barley, oats, alfalfa, and grass for hay and pasture. It is also used as rangeland.

This soil is well suited to nonirrigated crops. It is limited mainly by the short growing season and the hazards of water erosion and soil blowing. Minimum tillage, contour cultivation, grassed waterways, stubble-mulch tillage, and growing sod crops such as hay and pasture help to control soil blowing and water erosion.

The potential plant community on this soil is mainly bluebunch wheatgrass, western wheatgrass, green needlegrass, and needleandthread. If the range is excessively grazed, the proportion of some of these plants decreases and the proportion of needleandthread, blue grama, western wheatgrass, and Sandberg bluegrass increases. If excessive grazing continues, plants such as Kentucky bluegrass, timothy, perennial weeds, and red threeawn may invade. The potential plant community produces about 2,400 pounds of air-dry vegetation in years of above-normal precipitation and 1,900 pounds in years of below-normal precipitation.

This soil is suitable for seeding to adapted grasses and forbs if the range is in poor condition. Seedbed preparation and planting on the contour or across the slope, where practical, conserve moisture and help to control water erosion. The surface layer is susceptible to water erosion and soil blowing if it is disturbed or if the range is overgrazed.

This soil is suited to windbreaks, but the growth of both trees and shrubs is slow because of the low to moderate available water capacity. Suitable trees for planting are Russian-olive, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, western sandcherry, and skunkbush sumac. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings.

The main limitations for homesite development on this soil are moderate depth to sandstone, potential frost action, and low soil strength. The soil is severely limited for septic tank absorption fields because of the moderate depth to sandstone. Cuts to level building sites can expose sandstone. Frost action and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations.

This map unit is in capability subclass IIIe, nonirrigated, and in Silty range site, 15- to 19-inch precipitation zone.

120—Hibar-Castner loams, 2 to 8 percent slopes. This map unit is on uplands in the southern part of the county. Slopes commonly are 250 to 1,000 feet long. Elevation is 4,200 to 4,700 feet. The average annual precipitation is about 19 inches, the average annual air temperature is about 42 degrees F, and the average frost-free period is about 100 days.

This unit is about 60 percent Hibar loam and about 30 percent Castner loam. The Hibar soil is on plane side slopes, and the Castner soil is on ridges and knolls.

Included in this unit is about 10 percent Hibar channery loam on ridgetops and knolls.

The Hibar soil is moderately deep and well drained. It formed in residuum derived dominantly from fractured hard sandstone. Typically, the surface layer is dark grayish brown loam about 6 inches thick. The subsoil is brown loam about 16 inches thick. The substratum is very pale brown loam about 10 inches thick. Very pale brown sandstone is at a depth of about 32 inches. Depth to sandstone ranges from 20 to 40 inches.

Permeability of the Hibar soil is moderate. Available water capacity is low to moderate. Effective rooting depth is 20 to 40 inches. The average annual wetting

depth where this soil is under native vegetation is 20 to 40 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

The Castner soil is shallow and well drained. It formed in residuum derived dominantly from fractured hard sandstone. Typically, the surface layer is grayish brown loam about 7 inches thick. The underlying material is pale brown very channery loam about 7 inches thick. Light gray sandstone is at a depth of about 14 inches. Depth to sandstone ranges from 10 to 20 inches.

Permeability of the Castner soil is moderate. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. The average annual wetting depth where this soil is under native vegetation is 10 to 20 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

The soils in this unit are used for nonirrigated crops, mainly wheat, barley, oats, alfalfa, and grass for hay and pasture. They are also used as rangeland.

These soils are well suited to nonirrigated crops. They are limited mainly by the short growing season, the very low available water capacity of the Castner soil, and the hazards of water erosion and soil blowing. Minimum tillage, contour cultivation, grassed waterways, stubble-mulch tillage, and growing sod crops such as hay and pasture help to control soil blowing and water erosion.

The potential plant community on the Hibar soil is mainly bluebunch wheatgrass, green needlegrass, rough fescue, and western wheatgrass. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of Idaho fescue, needleandthread, western wheatgrass, and blue grama increases. If excessive grazing continues, plants such as timothy, Kentucky bluegrass, clubmoss, and perennial weeds may invade. The potential plant community produces about 2,400 pounds of air-dry vegetation in years of above-normal precipitation and 1,900 pounds in years of below-normal precipitation.

The potential plant community on the Castner soil is mainly rough fescue, bluebunch wheatgrass, plains muhly, and green needlegrass. If the range is excessively grazed, the proportion of these plants decreases and the proportion of Idaho fescue, blue grama, needleandthread, and prairie junegrass increases. If excessive grazing continues, plants such as Kentucky bluegrass, clubmoss, perennial weeds, and annuals may invade. The potential plant community produces about 1,200 pounds of air-dry vegetation in years of above-normal precipitation and 800 pounds in years of below-normal precipitation.

These soils are suitable for seeding to adapted grasses and forbs if the range is in poor condition. Seedbed preparation and planting on the contour or across the slope, where practical, conserve moisture and help to control water erosion. The surface layer is susceptible to water erosion and soil blowing if it is disturbed or if the range is overgrazed.

The Hibar soil is suited to windbreaks, but the low to moderate available water capacity of the soil limits the growth of both trees and shrubs. Suitable trees for planting are Russian-olive, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, western sandcherry, and skunkbush sumac. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings.

The Castner soil is poorly suited to windbreaks. It is limited mainly by the very low available water capacity.

The main limitations for homesite development on the soils in this unit are moderate and shallow depth to sandstone, potential frost action, and low soil strength. The soils are severely limited for septic tank absorption fields because of the moderate and shallow depth to sandstone. Cuts to level building sites can expose sandstone. Frost action and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations.

This map unit is in capability subclass IVe, nonirrigated. The Hibar soil is in Silty range site, 15- to 19-inch precipitation zone, and the Castner soil is in Shallow range site, 15- to 19-inch precipitation zone.

121—Hibar-Castner loams, 8 to 15 percent slopes. This map unit is on uplands in the southern part of the county. Slopes commonly are 250 to 1,000 feet long. Elevation is 4,200 to 4,700 feet. The average annual precipitation is about 19 inches, the average annual air temperature is about 42 degrees F, and the average frost-free period is about 100 days.

This unit is about 50 percent Hibar loam and about 40 percent Castner loam. The Hibar soil is on plane side slopes, and the Castner soil is on ridges and knolls.

Included in this unit is about 10 percent Castner channery loam.

The Hibar soil is moderately deep and well drained. It formed in residuum derived dominantly from fractured hard sandstone. Typically, the surface layer is dark grayish brown loam about 6 inches thick. The subsoil is brown heavy loam about 16 inches thick. The substratum is very pale brown heavy loam about 10 inches thick. Very pale brown sandstone is at a depth of about 32 inches. Depth to sandstone ranges from 20 to 40 inches.

Permeability of the Hibar soil is moderate. Available water capacity is low to moderate. Effective rooting depth is 20 to 40 inches. The average annual wetting depth where this soil is under native vegetation is 20 to 40 inches. Runoff is medium, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

The Castner soil is shallow and well drained. It formed in residuum derived dominantly from fractured hard sandstone. Typically, the surface layer is grayish brown

loam about 7 inches thick. The underlying material is pale brown very channery loam about 7 inches thick. Light gray sandstone is at a depth of about 14 inches. Depth to sandstone ranges from 10 to 20 inches.

Permeability of the Castner soil is moderate. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. The average annual wetting depth where this soil is under native vegetation is 10 to 20 inches. Runoff is medium, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

The soils in this unit are used mainly for hay and pasture. They are also used as rangeland.

These soils are poorly suited to cultivated crops because of the hazard of water erosion and the very low available water capacity of the Castner soil.

These soils are suited to hay and pasture. They are limited mainly by the hazards of water erosion and soil blowing and the very low available water capacity of the Castner soil. Maintaining a good plant cover on these soils helps to control soil blowing and water erosion. When reestablishing hay or pasture, seedbed preparation and planting on the contour or across the slope also help to control water erosion.

The potential plant community on the Hibar soil is mainly bluebunch wheatgrass, green needlegrass, rough fescue, and western wheatgrass. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of Idaho fescue, needleandthread, western wheatgrass, and blue grama increases. If excessive grazing continues, plants such as timothy, Kentucky bluegrass, clubmoss, and perennial weeds may invade. The potential plant community produces about 2,400 pounds of air-dry vegetation in years of above-normal precipitation and 1,900 pounds in years of below-normal precipitation.

The potential plant community on the Castner soil is mainly rough fescue, bluebunch wheatgrass, plains muhly, and green needlegrass. If the range is excessively grazed, the proportion of these plants decreases and the proportion of Idaho fescue, blue grama, needleandthread, and prairie junegrass increases. If excessive grazing continues, plants such as Kentucky bluegrass, clubmoss, perennial weeds, and annuals may invade. The potential plant community produces about 1,200 pounds of air-dry vegetation in years of above-normal precipitation and 800 pounds in years of below-normal precipitation.

These soils are suitable for seeding to adapted grasses and forbs if the range is in poor condition. Seedbed preparation and planting on the contour or across the slope, where practical, conserve moisture and help to control water erosion. The surface layer is susceptible to water erosion and soil blowing if it is disturbed or if the range is overgrazed.

The Hibar soil is suited to windbreaks, but the low to moderate available water capacity limits the growth of both trees and shrubs. Suitable trees for planting are Russian-olive, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, western sandcherry, and skunkbush sumac. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings. Planting on the contour helps to conserve moisture.

The Castner soil is poorly suited to windbreaks. It is limited mainly by the very low available water capacity.

The main limitations for homesite development on the soils in this unit are moderate and shallow depth to sandstone, potential frost action, and low soil strength. The soils are severely limited for septic tank absorption fields because of the moderate and shallow depth to sandstone. Cuts to level building sites can expose sandstone. Frost action and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations.

This map unit is in capability subclass VIe, nonirrigated. The Hibar soil is in Silty range site, 15- to 19-inch precipitation zone, and the Castner soil is in Shallow range site, 15- to 19-inch precipitation zone.

122—Hibar-Castner channery loams, 2 to 8 percent slopes. This map unit is on uplands in the southern part of the county. Slopes commonly are 250 to 1,000 feet long. Elevation is 4,200 to 4,700 feet. The average annual precipitation is about 19 inches, the average annual air temperature is 42 degrees F, and the average frost-free period is about 100 days.

This unit is about 45 percent Hibar channery loam and 40 percent Castner channery loam. The Hibar soil is on plane side slopes, and the Castner soil is on ridges and knolls.

Included in this unit are about 10 percent Hibar loam and 5 percent Castner loam.

The Hibar soil is moderately deep and well drained. It formed in residuum derived dominantly from fractured hard sandstone. Typically, the surface layer is dark grayish brown channery loam about 6 inches thick. The subsoil is brown heavy loam about 16 inches thick. The substratum is very pale brown heavy loam about 10 inches thick. Very pale brown sandstone is at a depth of about 32 inches. Depth to sandstone ranges from 20 to 40 inches.

Permeability of the Hibar soil is moderate. Available water capacity is low to moderate. Effective rooting depth is 20 to 40 inches. The average annual wetting depth where this soil is under native vegetation is 20 to 40 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

The Castner soil is shallow and well drained. It formed in residuum derived dominantly from fractured hard sandstone. Typically, the surface layer is grayish brown channery loam about 7 inches thick. The underlying

material is pale brown very channery loam about 7 inches thick. Light gray sandstone is at a depth of about 14 inches. Depth to sandstone ranges from 10 to 20 inches.

Permeability of the Castner soil is moderate. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. The average annual wetting depth where this soil is under native vegetation is 10 to 20 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

The soils in this unit are used mainly for hay and pasture and as rangeland. They are also used for nonirrigated crops such as wheat, barley, and oats.

These soils are suited to nonirrigated crops. They are limited mainly by the short growing season, the very low available water capacity of the Castner soil, and the hazards of water erosion and soil blowing. Minimum tillage, contour cultivation, grassed waterways, stubble mulch tillage, and growing sod crops such as hay and pasture help to control soil blowing and water erosion.

The potential plant community on the Hibar soil is mainly bluebunch wheatgrass, green needlegrass, rough fescue, and western wheatgrass. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of Idaho fescue, needleandthread, western wheatgrass, and blue grama increases. If excessive grazing continues, plants such as timothy, Kentucky bluegrass, clubmoss, and perennial weeds may invade. The potential plant community produces about 2,400 pounds of air-dry vegetation in years of above-normal precipitation and 1,900 pounds in years of below-normal precipitation.

The potential plant community on the Castner soil is mainly rough fescue, bluebunch wheatgrass, plains muhly, and green needlegrass. If the range is excessively grazed, the proportion of these plants decreases and the proportion of Idaho fescue, blue grama, needleandthread, and prairie junegrass increases. If excessive grazing continues, plants such as Kentucky bluegrass, clubmoss, perennial weeds, and annuals may invade. The potential plant community produces about 1,200 pounds of air-dry vegetation in years of above-normal precipitation and 800 pounds in years of below-normal precipitation.

These soils are suitable for seeding to adapted grasses and forbs if the range is in poor condition. Seedbed preparation and planting on the contour or across the slope, where practical, conserve moisture and help to control water erosion. The surface layer is susceptible to water erosion and soil blowing if it is disturbed or if the range is overgrazed.

The Hibar soil is suited to windbreaks, but the low to moderate available water capacity of the soil limits the growth of both trees and shrubs. Suitable trees for planting are Russian-olive, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, western sandcherry, and skunkbush sumac. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings.

The Castner soil is poorly suited to windbreaks. It is limited mainly by the very low available water capacity.

The main limitations for homesite development on the soils in this unit are moderate and shallow depth to sandstone, potential frost action, and low soil strength. The soils are severely limited for septic tank absorption fields because of the moderate and shallow depth to sandstone. Cuts to level building sites can expose sandstone. Frost action and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations.

This map unit is in capability subclass IVe, nonirrigated. The Hibar soil is in Silty range site, 15- to 19-inch precipitation zone, and the Castner soil is in Shallow range site, 15- to 19-inch precipitation zone.

123—Hoosan silty clay loam, 2 to 8 percent slopes. This deep, well drained soil is on fans, foot slopes, and terraces in the southern part of the county. It formed in alluvium derived dominantly from shale and limestone. Slopes commonly are 250 to 1,000 feet long. Elevation is 4,700 to 5,600 feet. The average annual precipitation is about 22 inches, the average annual air temperature is about 40 degrees F, and the average frost-free period is about 70 days.

Typically, the surface layer of this Hoosan soil is very dark gray silty clay loam about 12 inches thick. The subsoil is grayish brown silty clay loam about 22 inches thick. The substratum to a depth of 60 inches or more is light brownish gray silty clay loam.

Included in this unit are small convex areas of soils that are similar to this Hoosan soil but have a thinner surface layer.

Permeability is moderately slow. Available water capacity is high. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is slight.

This soil is used mainly for hay and pasture. It is also used for nonirrigated crops, such as wheat, barley, and oats, and as rangeland.

This soil is suited to nonirrigated crops. It is limited mainly by the short growing season and the hazard of water erosion. Timeliness is of prime importance in all tillage, seeding, and harvesting operations. Minimum tillage, contour cultivation, grassed waterways, stubble-mulch tillage, and growing sod crops such as hay and pasture help to control water erosion.

The potential plant community on this soil is mainly rough fescue, bearded wheatgrass, mountain brome, and Columbia needlegrass. If the range is excessively grazed, the proportion of these plants decreases and the

proportion of Idaho fescue, western wheatgrass, big sagebrush, and lupine increases. If excessive grazing continues, plants such as Kentucky bluegrass, timothy, perennial forbs, and annuals may invade. The potential plant community produces about 3,500 pounds of air-dry vegetation in years of above-normal precipitation and 2,700 pounds in years of below-normal precipitation.

This soil is suitable for seeding to adapted grasses and forbs if the range is in poor condition. Seedbed preparation and planting on the contour or across the slope, where practical, conserve moisture and help to control water erosion. The surface layer is susceptible to water erosion if it is disturbed or if the range is overgrazed.

This soil is well suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian crabapple, green ash, Siberian elm, white willow, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and cotoneaster. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings.

The main limitations for homesite development on this soil are moderately slow permeability, shrink-swell potential, potential frost action, and low soil strength. If the soil is used for septic tank absorption fields, the moderately slow permeability can be overcome by increasing the size of the absorption field. Shrinking and swelling, frost action, and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential.

This map unit is in capability subclass IVe, nonirrigated, and in Clayey range site, 20- to 24-inch precipitation zone.

124—Hughesville-Skaggs flaggy loams, 15 to 60 percent slopes. This map unit is on uplands in the southern part of the county. Slopes commonly are more than 1,000 feet long. Elevation is 4,000 to 6,000 feet. The average annual precipitation is about 19 inches, the average annual air temperature is about 42 degrees F, and the average frost-free period is about 90 days.

This unit is about 35 percent Hughesville flaggy loam on south-facing side slopes, 20 percent Hughesville flaggy loam on north-facing side slopes, and 20 percent Skaggs flaggy loam. The Hughesville soil is forested, and the Skaggs soil is in areas of grassland.

Included in this unit are small areas of deep Whitecow, Hanson, and Brazon soils and shallow Sheege soils. Included areas make up about 25 percent of the total acreage.

The Hughesville soil is moderately deep and well drained. It formed in residuum and colluvium derived dominantly from fractured hard limestone. Typically, the surface is covered by a mat of forest litter of decomposed and undecomposed needles, twigs, and cones about 2 inches thick. The surface layer is dark grayish brown flaggy loam about 2 inches thick. The upper 8 inches of the subsoil is brown flaggy loam, and the lower 12 inches is pale brown very flaggy loam. The upper 10 inches of the substratum is light gray extremely flaggy loam, and the lower 6 inches is white extremely flaggy loam. Limestone is at a depth of about 38 inches. Depth to limestone ranges from 20 to 40 inches.

Permeability of the Hughesville soil is moderate. Available water capacity is very low. Effective rooting depth is 20 to 40 inches. The average annual wetting depth of this soil under native vegetation is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

The Skaggs soil is moderately deep and well drained. It formed in residuum derived dominantly from fractured hard limestone. Typically, the surface layer is very dark grayish brown flaggy loam about 8 inches thick. The upper 16 inches of the underlying material is light gray and white very gravelly loam, and the lower 8 inches is pale yellow very gravelly clay loam. Limestone is at a depth of about 32 inches. Depth to limestone ranges from 20 to 40 inches.

Permeability of the Skaggs soil is moderate. Available water capacity is low. Effective rooting depth is 20 to 40 inches. The average annual wetting depth where this soil is under native vegetation is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

Most areas of the soils in this unit are used as rangeland. A few areas are used as woodland.

These soils are poorly suited to cultivated crops and to hay and pasture because of steepness of slope and rough topography.

The potential plant community on the Skaggs soil is mainly rough fescue, bluebunch wheatgrass, Columbia needlegrass, and mountain brome. If the range is excessively grazed, the proportion of these plants decreases and the proportion of Idaho fescue, western wheatgrass, Letterman needlegrass, and spikeoat increases. If excessive grazing continues, plants such as timothy, Kentucky bluegrass, onespike danthonia, and perennial forbs may invade. The potential plant community produces about 3,400 pounds of air-dry vegetation in years of above-normal precipitation and 2,400 pounds in years of below-normal precipitation.

The Hughesville soil is forested. It is suited to livestock grazing. The potential native understory vegetation on the south-facing slopes of the Hughesville soil is dominated by common juniper, arrowleaf balsamroot, Idaho fescue, Engelmann aster, Oregon-grape, creeping juniper, Rocky Mountain juniper, Columbia needlegrass,

and bluebunch wheatgrass. The understory provides moderate amounts of forage for livestock. Slopes of 30 to 60 percent adversely affect the distribution and management of livestock.

The south-facing slopes of the Hughesville soil are suited to the production of ponderosa pine. The site index is about 50 for ponderosa pine. At the culmination of the mean annual increment (CMAI), the south-facing slopes of the Hughesville soil can produce about 35 cubic feet, or 90 board feet (Scribner rule), of ponderosa pine per acre per year. Potential production is estimated for an even-aged, fully stocked stand of trees.

Seedling mortality is severe, plant competition is severe, and the hazard of windthrow is moderate. Where slopes are 15 to 30 percent, the hazard of erosion and equipment limitations are slight. Where slopes are 30 to 60 percent, the hazard of erosion and equipment limitations are moderate.

The potential native understory vegetation on the north-facing slopes of the Hughesville soil is dominated by common juniper, mallow ninebark, Columbia brome, Woods rose, pinegrass, common snowberry, white spirea, and elk sedge. The understory provides moderate amounts of forage for livestock.

The north-facing slopes of the Hughesville soil are suited to the production of Douglas-fir and ponderosa pine. The site index is about 40 for Douglas-fir and 60 for ponderosa pine. At the culmination of the mean annual increment (CMAI), the north-facing slopes of the Hughesville soil can produce about 55 cubic feet, or 160 board feet, of Douglas-fir and 45 cubic feet, or 130 board feet (Scribner rule), of ponderosa pine per acre per year. Potential production is estimated for an even-aged, fully stocked stand of trees.

Seedling mortality is moderate, plant competition is severe, and the hazard of windthrow is moderate. Where slopes are 15 to 30 percent, the hazard of erosion and equipment limitations are slight. Where slopes are 30 to 60 percent, the hazard of erosion and equipment limitations are moderate.

The main limitations of the Hughesville soil for management of timber are steepness of slope, depth to limestone, and very low available water capacity. Slopes of 30 to 60 percent restrict the kinds of equipment that can be used effectively in most areas. Line skidding of logs should be considered for the steeper slopes. Where slopes are 30 to 60 percent, minimizing erosion is essential in harvesting timber. Maintaining adequate plant cover on the disturbed areas and using sediment filter strips of undisturbed vegetation along streams reduce soil erosion and problems of water quality. Competition from understory vegetation and very low available water capacity make establishment of tree seedlings difficult. Reduction of plant competition helps in establishing seedlings. Road construction may be difficult because of the limited depth of the Hughesville and Skaggs soils.

This unit is poorly suited to homesite development because of the steepness of slope and the moderate depth to limestone in both soils.

This map unit is in capability subclass VIIe, nonirrigated. The south-facing areas of the Hughesville soil are in woodland suitability group 6f6 where slopes are 15 to 30 percent and group 6f8 where slopes are 30 to 60 percent; the north-facing areas of the Hughesville soil are in woodland suitability group 6f2 where slopes are 15 to 30 percent and group 6f4 where slopes are 30 to 60 percent. The Skaggs soil is in Silty range site, 20- to 24-inch precipitation zone.

125—Hughesville-Tibs-Whitecow complex, 2 to 25 percent slopes. This map unit is on mountainsides and uplands in the southern part of the county. Slopes commonly are more than 1,000 feet long. Elevation is 4,000 to 6,000 feet. The average annual precipitation is about 19 inches, the average annual air temperature is about 42 degrees F, and the average frost-free period is about 90 days.

This unit is about 20 percent Hughesville flaggy clay loam on south-facing side slopes, 10 percent Hughesville flaggy clay loam on north-facing side slopes, 25 percent Tibs clay loam, 15 percent Whitecow flaggy clay loam on south-facing side slopes, and 10 percent Whitecow flaggy clay loam on north-facing side slopes. The Whitecow and Tibs soils are in plane and concave areas, and the Hughesville soil is in convex areas and is along ridges.

Included in this unit are small areas of soils that are similar to the Hughesville soil in this unit but are reddish. Also included are small areas of shallow soils. Included areas make up about 20 percent of the total acreage.

The Hughesville soil is moderately deep and well drained. It formed in residuum and colluvium derived dominantly from fractured hard limestone. Typically, the surface is covered by a mat of forest litter of decomposed and undecomposed needles, twigs, and cones about 2 inches thick. The surface layer is dark grayish brown flaggy clay loam about 2 inches thick. The upper 8 inches of the subsoil is brown flaggy clay loam, and the lower 12 inches is pale brown very flaggy loam. The upper 10 inches of the substratum is light gray extremely flaggy loam, and the lower 6 inches is white extremely flaggy loam. Limestone is at a depth of about 38 inches. Depth to limestone ranges from 20 to 40 inches.

Permeability of the Hughesville soil is moderate. Available water capacity is very low. Effective rooting depth is 20 to 40 inches. The average annual wetting depth where this soil is under native vegetation is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

The Tibs soil is deep and well drained. It formed in colluvium and alluvium derived dominantly from shale and limestone. Typically, the surface is covered by a mat

of forest litter of undecomposed and decomposed needles, twigs, and cones about 1 inch thick. The surface layer is reddish brown clay loam about 6 inches thick. The underlying material to a depth of 60 inches or more is reddish brown and red very cobbly clay.

Permeability of the Tibs soil is slow. Available water capacity is low to moderate. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is 60 inches or more. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

The Whitecow soil is deep and well drained. It formed in colluvium and alluvium derived dominantly from limestone. Typically, the surface is covered by a mat of forest litter of undecomposed and decomposed needles, twigs, and cones about 2 inches thick. The surface layer is brown flaggy clay loam about 2 inches thick. The upper 7 inches of the subsoil is brown flaggy clay loam, and the lower 7 inches is brown very cobbly clay loam. The upper 11 inches of the substratum is pale brown very cobbly clay loam, and the lower part to a depth of 60 inches or more is very pale brown and pale brown extremely cobbly loam and extremely cobbly clay loam.

Permeability of the Whitecow soil is moderate. Available water capacity is low to moderate. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is 60 inches or more. Runoff is medium, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

The soils in this unit are used mainly as rangeland. They are also used as woodland.

These soils are poorly suited to cultivated crops and to hay and pasture because of the large stones in the surface layer.

The Hughesville, Tibs, and Whitecow soils are forested. They are well suited to livestock grazing. The potential native understory vegetation on the south-facing slopes of the Hughesville and Whitecow soils is dominated by common juniper, arrowleaf balsamroot, Idaho fescue, Engelmann aster, Oregon-grape, creeping juniper, Rocky Mountain juniper, Columbia needlegrass, and bluebunch wheatgrass. The understory provides moderate amounts of forage for livestock.

The south-facing slopes of the Hughesville and Whitecow soils are suited to the production of ponderosa pine. The site index is about 50 for ponderosa pine. At the culmination of the mean annual increment (CMAI), the south-facing slopes of the Hughesville and Whitecow soils can produce about 35 cubic feet, or 90 board feet (Scribner rule), of ponderosa pine per acre per year. Potential production is estimated for an even-aged, fully stocked stand of trees.

The hazard of erosion is slight, equipment limitations are slight, seedling mortality is severe, and plant competition is severe. The hazard of windthrow is moderate for Hughesville soils on south-facing slopes and slight for Whitecow soils on south-facing slopes.

The potential native understory vegetation on the north-facing slopes of the Hughesville and Whitecow soils is dominated by common juniper, mallow ninebark, Columbia brome, Woods rose, pinegrass, common snowberry, white spirea, and elk sedge. The understory provides moderate amounts of forage for livestock.

The north-facing slopes of the Hughesville and Whitecow soils are suited to the production of Douglas-fir and ponderosa pine. The site index is about 40 for Douglas-fir and 60 for ponderosa pine. At the culmination of the mean annual increment (CMAI), the north-facing slopes of the Hughesville and Whitecow soils can produce about 55 cubic feet, or 160 board feet, of Douglas-fir and 45 cubic feet, or 130 board feet (Scribner rule), of ponderosa pine per acre per year. Potential production is estimated for an even-aged, fully stocked stand of trees.

The hazard of erosion is slight, equipment limitations are slight, seedling mortality is moderate, and plant competition is severe. The hazard of windthrow is moderate for the Hughesville soil on north-facing slopes and slight for the Whitecow soil on north-facing slopes.

The main limitations of the Hughesville soil for management of timber are depth to limestone and very low available water capacity. Competition from understory vegetation and very low available water capacity make establishment of tree seedlings difficult. Reduction of plant competition helps in establishing seedlings. The limited soil depth restricts development of plant roots, which results in the trees being subject to windthrow. Maintaining small openings or progressively removing trees over a period of several years reduces windthrow.

The main limitation of the Whitecow soil for management of timber is moderate available water capacity. Competition of understory vegetation and moderate available water capacity make establishment of tree seedlings difficult. Reduction of plant competition helps to establish seedlings.

The potential native understory vegetation on the Tibs soil is dominated by common juniper, russet buffaloberry, Oregon-grape, common snowberry, white spirea, pinegrass, and Woods rose. The understory provides moderate amounts of forage for livestock.

The Tibs soil is suited to the production of ponderosa pine and Douglas-fir. The site index is about 58 for ponderosa pine and 35 for Douglas-fir. At the culmination of the mean annual increment (CMAI), the Tibs soil can produce about 45 cubic feet, or 120 board feet, of ponderosa pine and 45 cubic feet, or 130 board feet (Scribner rule), of Douglas-fir per acre per year. Potential production is estimated for an even-aged, fully stocked stand of trees.

The hazard of erosion is moderate, equipment limitations are moderate, seedling mortality is moderate,

plant competition is moderate, and the hazard of windthrow is slight for the Tibs soil.

The main limitations of the Tibs soil for management of timber are slow permeability, soil texture, and low soil strength. Slow permeability and steepness of slope increase the hazard of erosion. Maintaining adequate plant cover on the disturbed areas and using sediment filter strips of undisturbed vegetation along streams reduce soil erosion and problems of water quality. The cobbly clay loam texture of the surface layer limits the use of equipment. The soil has low strength when wet, which results in poor trafficability and in soil compaction if heavy equipment is used to yard logs. Operating equipment when the soil is dry or frozen overcomes these limitations. Reduction of plant competition helps in establishing seedlings.

The main limitations for homesite development on the Hughesville soil are moderate depth to limestone and content of rock fragments. This soil is severely limited for septic tank absorption fields because of the moderate depth to limestone. Slope is also a concern. Absorption lines should be installed on the contour. Cuts to level building sites can expose limestone. Removal of pebbles and cobbles in disturbed areas is needed for best results when landscaping, particularly in areas used for lawns.

The main limitations for homesite development on the Tibs soil are slow permeability, shrink-swell potential, potential frost action, content of rock fragments, and low soil strength. Slope is a concern in installing septic tank absorption fields. Absorption lines should be installed on the contour. If the soil is used for septic tank absorption fields, the slow permeability can be overcome by increasing the size of the absorption field. Shrinking and swelling, frost action, and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential.

The main limitation for homesite development on the Whitecow soil is content of rock fragments. Slope is a concern in installing septic tank absorption fields. Absorption lines should be installed on the contour. Removal of pebbles and cobbles in disturbed areas is needed for best results when landscaping, particularly in areas used for lawns.

This map unit is in capability subclass VIe, nonirrigated. The Hughesville soil is in woodland suitability group 6f6 on south-facing slopes and group 6f2 on north-facing slopes. The Tibs soil is in woodland suitability group 5c10. The Whitecow soil is in woodland suitability group 6o6 on south-facing slopes and group 6o4 on north-facing slopes.

126—Judith loam, 0 to 2 percent slopes. This deep, well drained soil is on terraces in the western and central parts of the county. It formed in alluvium derived dominantly from limestone. Slopes commonly are more than 1,000 feet long. Elevation is 4,000 to 4,700 feet. The average annual precipitation is about 19 inches, the average annual air temperature is about 42 degrees F, and the average frost-free period is about 100 days.

Included in this unit are small areas of Judith gravelly loam. A few cobbles are on the surface in some areas.

Typically, the surface layer of this Judith soil is dark grayish brown loam about 6 inches thick. The upper 11 inches of the subsoil is brown and very pale brown clay loam, and the lower 7 inches is white clay loam. The upper 22 inches of the substratum is very pale brown extremely gravelly loam, and the lower part to a depth of 66 inches or more is very pale brown extremely gravelly sandy clay loam.

Permeability is moderate to a depth of 24 inches and moderately rapid below this depth. Available water capacity is moderate. Effective rooting depth is 66 inches or more. The average annual wetting depth where this soil is under native vegetation is about 30 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high.

This soil is used primarily for nonirrigated crops, mainly wheat, barley, oats, alfalfa, and grass for hay and pasture. It is also used as rangeland.

This soil is well suited to nonirrigated crops. It is limited mainly by the hazard of soil blowing and the moderate available water capacity. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, stubble-mulch tillage, and growing sod crops such as hay and pasture help to control soil blowing.

The potential plant community on this soil is mainly bluebunch wheatgrass, green needlegrass, rough fescue, and western wheatgrass. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of Idaho fescue, needleandthread, western wheatgrass, and blue grama increases. If excessive grazing continues, plants such as timothy, Kentucky bluegrass, clubmoss, and perennial weeds may invade. The potential plant community produces about 2,200 pounds of air-dry vegetation in years of above-normal precipitation and 1,700 pounds in years of below-normal precipitation.

This soil is suitable for seeding to adapted grasses and forbs if the range is in poor condition. The surface layer is susceptible to soil blowing if it is disturbed or if the range is overgrazed.

This soil is suited to windbreaks, but the high concentration of lime at a depth of less than 15 inches and the limited moisture supply restrict the choice of trees and shrubs. Suitable trees for planting are Russian-olive, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, and skunkbush sumac. Summer fallow, cultivation for weed control, and adapted plants are

needed to insure establishment and survival of seedlings.

The main limitations for homesite development on this soil are potential frost action and low soil strength. Lawn grasses, shrubs, and trees that are not sensitive to lime-induced chlorosis are well suited to use in landscaping. An annual application of iron chelates reduces the chlorosis. Frost action and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. The very gravelly or extremely gravelly material below a depth of 24 to 40 inches is a good source of roadfill.

This map unit is in capability subclass IIIe, nonirrigated, and in Silty range site, 15- to 19-inch precipitation zone.

127—Judith gravelly loam, 2 to 4 percent slopes. This deep, well drained soil is on terraces in the western and central parts of the county. It formed in alluvium derived dominantly from limestone. Slopes commonly are 250 to 1,000 feet long. Elevation is 4,000 to 4,700 feet. The average annual precipitation is about 19 inches, the average annual air temperature is about 42 degrees F, and the average frost-free period is about 100 days.

Included in this unit are small areas of deep Windham soils on ridges.

Typically, the surface layer of this Judith soil is dark grayish brown gravelly loam about 6 inches thick. The upper 11 inches of the subsoil is brown and very pale brown clay loam, and the lower 7 inches is white clay loam. The upper 22 inches of the substratum is very pale brown extremely gravelly loam, and the lower part to a depth of 66 inches or more is very pale brown extremely gravelly sandy clay loam.

Permeability is moderate to a depth of 24 inches and moderately rapid below this depth. Available water capacity is moderate. Effective rooting depth is 66 inches or more. The average annual wetting depth where this soil is under native vegetation is about 30 inches. Runoff is slow, and the hazard of water erosion is moderate. The hazard of soil blowing is high.

This soil is used primarily for nonirrigated crops, mainly wheat, barley, oats, alfalfa, and grass for hay and pasture. It is also used as rangeland.

This soil is suited to nonirrigated crops. It is limited mainly by the hazards of soil blowing and water erosion and the moderate available water capacity. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, stubble-mulch tillage, grassed waterways, and growing sod crops such as hay and pasture help to control soil blowing and water erosion.

The potential plant community on this soil is mainly bluebunch wheatgrass, green needlegrass, rough fescue, and western wheatgrass. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of Idaho fescue, needleandthread, western wheatgrass, and blue grama increases. If excessive grazing continues, plants such as timothy, Kentucky bluegrass, clubmoss, and perennial weeds may invade. The potential plant community produces about 2,200 pounds of air-dry vegetation in years of above-normal precipitation and 1,700 pounds in years of below-normal precipitation.

This soil is suitable for seeding to adapted grasses and forbs if the range is in poor condition. Seedbed preparation and planting on the contour or across the slope, where practical, conserve moisture and help to control water erosion. The surface layer is susceptible to water erosion and soil blowing if it is disturbed or if the range is overgrazed.

This soil is suited to windbreaks, but the high concentration of lime at a depth of less than 15 inches and the limited moisture supply restrict the choice of trees and shrubs. Suitable trees for planting are Russian-olive, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, and skunkbush sumac. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings.

The main limitations for homesite development on this soil are potential frost action and low soil strength. Frost action and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. The very gravelly or extremely gravelly material below a depth of 24 to 40 inches is good roadfill. Lawn grasses, shrubs, and trees that are not sensitive to lime-induced chlorosis are well suited to use in landscaping. An annual application of iron chelates reduces the chlorosis.

This map unit is in capability subclass IIIe, nonirrigated, and in Silty range site, 15- to 19-inch precipitation zone.

128—Judith-Judell clay loams, 0 to 2 percent slopes. This map unit is on terraces in the western and southern parts of the county. Slopes commonly are more than 1,000 feet long. Elevation is 3,200 to 4,500 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 120 days.

This unit is about 45 percent Judith clay loam and 40 percent Judell clay loam.

Included in this unit are small areas of Judith gravelly clay loam and deep Windham soils. Included areas make up about 15 percent of the total acreage.

The Judith soil is deep and well drained. It formed in alluvium derived dominantly from limestone. Typically, the surface layer is dark grayish brown clay loam about 6 inches thick. The upper 11 inches of the subsoil is brown and very pale brown clay loam, and the lower 7 inches is white clay loam. The upper 22 inches of the substratum is very pale brown extremely gravelly loam, and the

lower part to a depth of 66 inches or more is very pale brown extremely gravelly sandy clay loam.

Permeability of the Judith soil is moderate to a depth of 24 inches and moderately rapid below this depth. Available water capacity is moderate. Effective rooting depth is 66 inches or more. The average annual wetting depth where this soil is under native vegetation is about 30 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high.

The Judell soil is deep and well drained. It formed in alluvium derived dominantly from limestone. Typically, the surface layer is dark grayish brown clay loam about 7 inches thick. The subsoil is pale brown and very pale brown clay loam about 20 inches thick. The upper 26 inches of the substratum is very pale brown loam, and the lower part to a depth of 66 inches or more is pale brown extremely gravelly loam.

Permeability of the Judell soil is moderate to a depth of 53 inches and moderately rapid below that depth. Available water capacity is high. Effective rooting depth is 66 inches or more. The average annual wetting depth where this soil is under native vegetation is about 30 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high.

The soils in this unit are used mainly for nonirrigated crops such as wheat, barley, and oats. They are also used for hay and pasture and as rangeland.

These soils are well suited to nonirrigated crops. They are limited mainly by the hazard of soil blowing and the moderate available water capacity of the Judith soil. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, stubble-mulch tillage, and growing sod crops such as hay and pasture help to control soil blowing.

The potential plant community on these soils is mainly bluebunch wheatgrass, green needlegrass, western wheatgrass, and Idaho fescue. If the range is excessively grazed, the proportion of these plants decreases and the proportion of Idaho fescue, plains reedgrass, Sandberg bluegrass, and blue grama increases. If excessive grazing continues, plants such as broom snakeweed, Kentucky bluegrass, perennial weeds, and annuals may invade. The potential plant community produces about 2,300 pounds of air-dry vegetation in years of above-normal precipitation and 1,700 pounds in years of below-normal precipitation.

These soils are suitable for seeding to adapted grasses and forbs if the range is in poor condition. The surface layer is susceptible to soil blowing if it is disturbed or if the range is overgrazed.

The Judith soil is suited to windbreaks, but the high concentration of lime at a depth of less than 15 inches and the limited moisture supply restrict the choice of trees and shrubs. Suitable trees for planting are Russian-olive, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, and skunkbush sumac.

The Judell soil is suited to windbreaks, but the high concentration of lime below a depth of 15 inches and the limited moisture supply restrict the choice of trees and shrubs. Suitable trees for planting are Russian-olive, Siberian elm, white willow, golden willow, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, skunkbush sumac, and silver buffaloberry.

Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings on these soils.

The main limitations for homesite development on the soils in this unit are potential frost action, low soil strength, and the moderate permeability of the Judell soil. If the Judell soil is used for septic tank absorption fields, the moderate permeability can be overcome by increasing the size of the absorption field. Frost action and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. The very gravelly or extremely gravelly material of the Judith soil below a depth of about 24 inches is good roadfill.

This map unit is in capability subclass IIIe, nonirrigated, and in Clayey range site, 15- to 19-inch precipitation zone.

129—Judith-Judell clay loams, 2 to 4 percent slopes. This map unit is on terraces in the western and southern parts of the county. Slopes commonly are 250 to 1,000 feet long. Elevation is 3,200 to 4,500 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 120 days.

This unit is about 50 percent Judith clay loam and 40 percent Judell clay loam.

Included in this unit are small areas of deep Windham soils on ridges, Judith gravelly clay loam, and Judell gravelly clay loam. Included areas make up about 10 percent of the total acreage.

The Judith soil is deep and well drained. It formed in alluvium derived dominantly from limestone. Typically, the surface layer is dark grayish brown clay loam about 6 inches thick. The upper 11 inches of the subsoil is brown and very pale brown clay loam, and the lower 7 inches is white clay loam. The upper 22 inches of the substratum is very pale brown extremely gravelly loam, and the lower part to a depth of 66 inches or more is very pale brown extremely gravelly sandy clay loam.

Permeability of the Judith soil is moderate to a depth of 24 inches and moderately rapid below this depth. Available water capacity is moderate. Effective rooting depth is 66 inches or more. The average annual wetting depth where this soil is under native vegetation is about 30 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high.

The Judell soil is deep and well drained. It formed in alluvium derived dominantly from limestone. Typically, the surface layer is dark grayish brown clay loam about 7 inches thick. The subsoil is pale brown and very pale brown clay loam about 20 inches thick. The upper 26 inches of the substratum is very pale brown loam, and the lower part to a depth of 66 inches or more is pale brown extremely gravelly loam.

Permeability of the Judell soil is moderate to a depth of 53 inches and moderately rapid below that depth. Available water capacity is high. Effective rooting depth is 66 inches or more. The average annual wetting depth where this soil is under native vegetation is about 30 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high.

The soils in this unit are used mainly for nonirrigated crops such as wheat, barley, and oats. They are also used for hay and pasture and as rangeland.

These soils are well suited to nonirrigated crops. They are limited mainly by the hazards of water erosion and soil blowing and the moderate available water capacity of the Judith soil. Minimum tillage, contour cultivation, grassed waterways, stripcropping, and growing sod crops such as hay and pasture help to control soil blowing and water erosion.

The potential plant community on these soils is mainly bluebunch wheatgrass, green needlegrass, western wheatgrass, and Idaho fescue. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of Idaho fescue, plains reedgrass, Sandberg bluegrass, and blue grama increases. If excessive grazing continues, plants such as broom snakeweed, Kentucky bluegrass, perennial weeds, and annuals may invade. The potential plant community produces about 2,300 pounds of air-dry vegetation in years of above-normal precipitation and 1,700 pounds in years of below-normal precipitation.

These soils are suitable for seeding to adapted grasses and forbs if the range is in poor condition. Seedbed preparation and planting on the contour or across the slope, where practical, conserve moisture and help to control water erosion. The surface layer is susceptible to water erosion and soil blowing if it is disturbed or if the range is overgrazed.

The Judith soil is suited to windbreaks, but the high concentration of lime at a depth of less than 15 inches and the limited moisture supply restrict the choice of trees and shrubs. Suitable trees for planting are Russian-olive, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, and skunkbush sumac.

The Judell soil is suited to windbreaks, but the high concentration of lime below a depth of 15 inches and the limited moisture supply restrict the choice of trees and shrubs. Suitable trees for planting are Russian-olive, Siberian elm, white willow, golden willow, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, skunkbush sumac, and silver buffaloberry.

Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings on these soils.

The main limitations for homesite development on the soils in this unit are potential frost action, low soil strength, and the moderate permeability of the Judell soil. If the Judell soil is used for septic tank absorption fields, the moderate permeability can be overcome by increasing the size of the absorption field. Frost action and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. The very gravelly or extremely gravelly material in the Judith soil below a depth of about 24 inches is good roadfill.

This map unit is in capability subclass IIIe, nonirrigated, and in Clayey range site, 15- to 19-inch precipitation zone.

130—Judith-Tamaneen clay loams, 0 to 2 percent slopes. This map unit is on terraces in the western and southern parts of the county. Slopes commonly are more than 1,000 feet long. Elevation is 3,200 to 4,400 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 120 days.

This unit is about 60 percent Judith clay loam and 30 percent Tamaneen clay loam. The Judith soil is on slight rises, and the Tamaneen soil is in slightly concave areas.

Included in this unit is about 10 percent Windham soils in convex areas.

The Judith soil is deep and well drained. It formed in alluvium derived dominantly from limestone. Typically, the surface layer is dark grayish brown clay loam about 6 inches thick. The upper 11 inches of the subsoil is brown and very pale brown clay loam, and the lower 7 inches is white clay loam. The upper 22 inches of the substratum is very pale brown extremely gravelly loam, and the lower part to a depth of 66 inches or more is very pale brown extremely gravelly sandy clay loam.

Permeability of the Judith soil is moderate to a depth of 24 inches and moderately rapid below this depth. Available water capacity is moderate. Effective rooting depth is 66 inches or more. The average annual wetting depth where this soil is under native vegetation is about 30 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high.

The Tamaneen soil is deep and well drained. It formed in alluvium derived dominantly from limestone. Typically, the surface layer is dark grayish brown clay loam about 7 inches thick. The upper 6 inches of the subsoil is grayish brown silty clay, and the lower 4 inches is pale brown clay loam. The upper 5 inches of the substratum is very pale brown very gravelly loam, and the lower part to a

depth of 66 inches is very pale brown extremely gravelly sandy loam.

Permeability of the Tamaneen soil is moderately slow to a depth of 22 inches and moderately rapid below this depth. Available water capacity is low to moderate. Effective rooting depth is 66 inches or more. The average annual wetting depth where this soil is under native vegetation is about 26 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

The soils in this unit are used mainly for nonirrigated crops such as wheat, barley, and oats. They are also used for hay and pasture and as rangeland.

These soils are well suited to nonirrigated crops. They are limited mainly by the hazard of soil blowing and the low to moderate available water capacity. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, stubble-mulch tillage, and growing sod crops such as hay and pasture help to control soil blowing.

The potential plant community on these soils is mainly bluebunch wheatgrass, green needlegrass, western wheatgrass, and Idaho fescue. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of Idaho fescue, plains reedgrass, Sandberg bluegrass, and blue grama increases. If excessive grazing continues, plants such as broom snakeweed, Kentucky bluegrass, perennial weeds, and annuals may invade. The potential plant community produces about 2,200 pounds of air-dry vegetation in years of above-normal precipitation and 1,600 pounds in years of below-normal precipitation.

These soils are suitable for seeding to adapted grasses and forbs if the range is in poor condition. The surface layer is susceptible to soil blowing if it is disturbed or if the range is overgrazed.

The Judith soil is suited to windbreaks, but the high concentration of lime at a depth of less than 15 inches and the limited moisture supply restrict the choice of trees and shrubs. Suitable trees for planting are Russian-olive, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, and skunkbush sumac.

The Tamaneen soil is suited to windbreaks, but the moderate to low available water capacity of the soil limits the growth of both trees and shrubs. Suitable trees for planting are Russian-olive, Siberian crabapple, green ash, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and cotoneaster.

Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings on these soils.

The main limitations for homesite development on the soils in this unit are potential frost action, low soil strength, and the shrink-swell potential of the Tamaneen soil. Shrinking and swelling, frost action, and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. The very gravelly or extremely gravelly material below a depth of about 20 inches is good roadfill. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential.

This map unit is in capability subclass IIIe, nonirrigated, and in Clayey range site, 15- to 19-inch precipitation zone.

131—Judith-Windham clay loams, 0 to 2 percent slopes. This map unit is on terraces in the western and southern parts of the county. Slopes commonly are more than 1,000 feet long. Elevation is 3,200 to 4,400 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 120 days.

This unit is about 50 percent Judith clay loam and 40 percent Windham clay loam.

Included in this unit is about 10 percent Windham gravelly clay loam on rises.

The Judith soil is deep and well drained. It formed in alluvium derived dominantly from limestone. Typically, the surface layer is dark grayish brown clay loam about 6 inches thick. The upper 11 inches of the subsoil is brown and very pale brown clay loam, and the lower 7 inches is white clay loam. The upper 22 inches of the substratum is very pale brown extremely gravelly loam, and the lower part to a depth of 66 inches or more is very pale brown extremely gravelly sandy clay loam.

Permeability of the Judith soil is moderate to a depth of 24 inches and moderately rapid below this depth. Available water capacity is moderate. Effective rooting depth is 66 inches or more. The average annual wetting depth where this soil is under native vegetation is about 30 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high.

The Windham soil is deep and well drained. It formed in alluvium derived dominantly from limestone. Typically, the surface layer is dark grayish brown clay loam about 6 inches thick. The subsoil is pale brown gravelly clay loam about 6 inches thick. The upper 6 inches of the substratum is white very gravelly loam, and the lower part to a depth of 60 inches or more is very pale brown extremely gravelly loam.

Permeability of the Windham soil is moderate to a depth of 18 inches and moderately rapid below this depth. Available water capacity is very low to low. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is about 30 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high.

The soils in this unit are used mainly for nonirrigated crops such as wheat, barley, and oats. They are also used for hay and pasture and as rangeland.

These soils are well suited to nonirrigated crops. They are limited mainly by the hazard of soil blowing and the very low to moderate available water capacity. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, stubble-mulch tillage, and growing sod crops such as hay and pasture help to control soil blowing.

The potential plant community on the Judith soil is mainly bluebunch wheatgrass, green needlegrass, western wheatgrass, and Idaho fescue. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of Idaho fescue, plains reedgrass, Sandberg bluegrass, and blue grama increases. If excessive grazing continues, plants such as broom snakeweed, Kentucky bluegrass, perennial weeds, and annuals may invade. The potential plant community produces about 2,300 pounds of air-dry vegetation in years of above-normal precipitation and 1,700 pounds in years of below-normal precipitation.

The potential plant community on the Windham soil is mainly bluebunch wheatgrass, western wheatgrass, green needlegrass, and needleandthread. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of needleandthread, blue grama, fringed sagewort, and wild rose increases. If excessive grazing continues, plants such as broom snakeweed, clubmoss, perennial weeds, and annuals may invade. The potential plant community produces about 1,400 pounds of air-dry vegetation in years of above-normal precipitation and 700 pounds in years of below-normal precipitation.

These soils are suitable for seeding to adapted grasses and forbs if the range is in poor condition. The surface layer is susceptible to soil blowing if it is disturbed or if the range is overgrazed.

These soils are suited to windbreaks, but the high concentration of lime at a depth of less than 15 inches and the limited moisture supply restrict the choice of trees and shrubs. Suitable trees for planting are Russian-olive, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, and skunkbush sumac. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings.

The main limitations for homesite development on the soils in this unit are potential frost action, and low soil strength. Frost action and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. The very gravelly or extremely gravelly material below a depth of about 15 inches is good roadfill. Lawn grasses, shrubs, and trees that are not sensitive to lime-induced chlorosis are well suited to use in landscaping. An annual application of iron chelates reduces the chlorosis.

This map unit is in capability subclass IIIe, nonirrigated. The Judith soil is in Clayey range site, 15- to 19-inch precipitation zone, and the Windham soil is in Limy range site, 15- to 19-inch precipitation zone.

132—Judith-Windham gravelly clay loams, 0 to 2 percent slopes. This map unit is on terraces in the western and southern parts of the county. Slopes commonly are more than 1,000 feet long. Elevation is 3,200 to 4,400 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 120 days.

This unit is about 50 percent Judith gravelly clay loam and 40 percent Windham gravelly clay loam. The Judith soil is on plane side slopes, and the Windham soil is on convex side slopes.

Included in this unit is about 10 percent Judith clay loam.

The Judith soil is deep and well drained. It formed in alluvium derived dominantly from limestone. Typically, the surface layer is dark grayish brown gravelly clay loam about 6 inches thick. The upper 11 inches of the subsoil is brown and very pale brown clay loam, and the lower 7 inches is white clay loam. The upper 22 inches of the substratum is very pale brown extremely gravelly loam, and the lower part to a depth of 66 inches or more is very pale brown extremely gravelly sandy clay loam.

Permeability of the Judith soil is moderate to a depth of 24 inches and moderately rapid below this depth. Available water capacity is moderate. Effective rooting depth is 66 inches or more. The average annual wetting depth where this soil is under native vegetation is about 30 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high.

The Windham soil is deep and well drained. It formed in alluvium derived dominantly from limestone. Typically, the surface layer is dark grayish brown gravelly clay loam about 6 inches thick. The subsoil is pale brown gravelly clay loam about 6 inches thick. The upper 6 inches of the substratum is white very gravelly loam, and the lower part to a depth of 60 inches or more is very pale brown extremely gravelly loam.

Permeability of the Windham soil is moderate to a depth of 18 inches and moderately rapid below this depth. Available water capacity is very low to low. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is about 30 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high.

The soils in this unit are used mainly for nonirrigated crops such as wheat, barley, and oats. They are also used for hay and pasture and as rangeland.

These soils are well suited to nonirrigated crops. They are limited mainly by the hazard of soil blowing, the very low to moderate available water capacity, and the presence of pebbles and cobbles in the surface layer. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, stubble-mulch tillage, and growing sod crops such as hay and pasture help to control soil blowing.

The potential plant community on the Judith soil is mainly bluebunch wheatgrass, green needlegrass, western wheatgrass, and Idaho fescue. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of Idaho fescue, plains reedgrass, Sandberg bluegrass, and blue grama increases. If excessive grazing continues, plants such as broom snakeweed, Kentucky bluegrass, perennial weeds, and annuals may invade. The potential plant community produces about 2,300 pounds of air-dry vegetation in years of above-normal precipitation and 1,700 pounds in years of below-normal precipitation.

The potential plant community on the Windham soil is mainly bluebunch wheatgrass, western wheatgrass, green needlegrass, and needleandthread. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of needleandthread, blue grama, fringed sagewort, and wild rose increases. If excessive grazing continues, plants such as broom snakeweed, clubmoss, perennial weeds, and annuals may invade. The potential plant community produces about 1,400 pounds of air-dry vegetation in years of above-normal precipitation and 700 pounds in years of below-normal precipitation.

These soils are suitable for seeding to adapted grasses and forbs if the range is in poor condition. The surface layer is susceptible to soil blowing if it is disturbed or if the range is overgrazed.

These soils are suited to windbreaks, but the high concentration of lime at a depth of less than 15 inches and the limited moisture supply restrict the choice of trees and shrubs. Suitable trees for planting are Russian-olive, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, and skunkbush sumac. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings.

The main limitations for homesite development on the soils in this unit are potential frost action, content of rock fragments, and low soil strength. Frost action and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. The very gravelly or extremely gravelly material below a depth of about 12 inches is good roadfill. Removal of pebbles and cobbles in disturbed areas is needed for best results when landscaping, particularly in areas used for lawns. Lawn grasses, shrubs, and trees that are not sensitive to lime-induced chlorosis are well suited to use in landscaping. An annual application of iron chelates reduces the chlorosis.

This map unit is in capability subclass IIIe, nonirrigated. The Judith soil is in Clayey range site, 15- to 19-inch precipitation zone, and the Windham soil is in Limy range site, 15- to 19-inch precipitation zone.

133—Judith-Windham gravelly clay loams, 2 to 8 percent slopes. This map unit is on terraces and fans in the western and southern parts of the county. Slopes commonly are 250 to 1,000 feet long. Elevation is 3,200 to 4,400 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 120 days.

This unit is about 50 percent Judith gravelly clay loam and 40 percent Windham gravelly clay loam. The Judith soil is on plane and concave side slopes, and the Windham soil is on convex side slopes.

Included in this unit are small areas of Judith clay loam on plane side slopes and Windham very gravelly loam and Windham extremely gravelly loam in convex areas. Included areas make up about 10 percent of the total acreage.

The Judith soil is deep and well drained. It formed in alluvium derived dominantly from limestone. Typically, the surface layer is dark grayish brown gravelly clay loam about 6 inches thick. The upper 11 inches of the subsoil is brown and very pale brown clay loam, and the lower 7 inches is white clay loam. The upper 22 inches of the substratum is very pale brown extremely gravelly loam, and the lower part to a depth of 66 inches or more is very pale brown extremely gravelly sandy clay loam.

Permeability of the Judith soil is moderate to a depth of 24 inches and moderately rapid below this depth. Available water capacity is moderate. Effective rooting depth is 66 inches or more. The average annual wetting depth where this soil is under native vegetation is about 30 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high.

The Windham soil is deep and well drained. It formed in alluvium derived dominantly from limestone. Typically, the surface layer is dark grayish brown gravelly clay loam about 6 inches thick. The subsoil is pale brown gravelly clay loam about 6 inches thick. The upper 6 inches of the substratum is white very gravelly loam, and the lower part to a depth of 60 inches or more is very pale brown extremely gravelly loam.

Permeability of the Windham soil is moderate to a depth of 18 inches and moderately rapid below this depth. Available water capacity is very low to low. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is about 30 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high.

The soils in this unit are used mainly for nonirrigated crops such as wheat, barley, and oats. They are also used for hay and pasture and as rangeland.

These soils are suited to nonirrigated crops. They are limited mainly by the hazards of soil blowing and water erosion, the very low to moderate available water capacity, and the presence of pebbles and cobbles in the surface layer. Minimum tillage, contour cultivation, grassed waterways, stripcropping, and growing sod crops such as hay and pasture help to control soil blowing and water erosion. Tall grass barriers trap snow, which increases the amount of moisture in the soil.

The potential plant community on the Judith soil is mainly bluebunch wheatgrass, green needlegrass, western wheatgrass, and Idaho fescue. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of Idaho fescue, plains reedgrass, Sandberg bluegrass, and blue grama increases. If excessive grazing continues, plants such as broom snakeweed, Kentucky bluegrass, perennial weeds, and annuals may invade. The potential plant community produces about 2,300 pounds of air-dry vegetation in years of above-normal precipitation and 1,700 pounds in years of below-normal precipitation.

The potential plant community on the Windham soil is mainly bluebunch wheatgrass, western wheatgrass, green needlegrass, and needleandthread. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of needleandthread, blue grama, fringed sagewort, and wild rose increases. If excessive grazing continues, plants such as broom snakeweed, clubmoss, perennial weeds, and annuals may invade. The potential plant community produces about 1,400 pounds of air-dry vegetation in years of above-normal precipitation and 700 pounds in years of below-normal precipitation.

These soils are suitable for seeding to adapted grasses and forbs if the range is in poor condition. Seedbed preparation and planting on the contour or across the slope, where practical, conserve moisture and help to control water erosion. The surface layer is susceptible to water erosion and soil blowing if it is disturbed or if the range is overgrazed.

These soils are suited to windbreaks, but the high concentration of lime at a depth of less than 15 inches and the limited moisture supply restrict the choice of trees and shrubs. Suitable trees for planting are Russian-olive, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, and skunkbush sumac. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings.

The main limitations for homesite development on the soils in this unit are potential frost action and low soil strength. Frost action and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. The very gravelly or extremely gravelly material below a depth of about 15 inches is good roadfill. Removal of pebbles and cobbles in disturbed areas is needed for best results when landscaping, particularly in areas used for lawns. Lawn grasses, shrubs, and trees that are not sensitive to lime-induced chlorosis are well suited to use in landscaping. An annual application of iron chelates reduces the chlorosis.

This map unit is in capability subclass IVe, nonirrigated. The Judith soil is in Clayey range site, 15- to 19-inch precipitation zone, and the Windham soil is in Limy range site, 15- to 19-inch precipitation zone.

134—Judith-Windham gravelly clay loams, 8 to 15 percent slopes. This map unit is on terrace edges in the western and southern parts of the county. Slopes commonly are 250 to 1,000 feet long. Elevation is 3,200 to 4,400 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 120 days.

This unit is about 40 percent Judith gravelly clay loam and 40 percent Windham gravelly clay loam. The Judith soil is on plane and convex side slopes below areas of the Windham soil. The Windham soil is on terrace edges.

Included in this unit are small areas of Windham very gravelly clay loam on knolls and small areas of moderately deep Winifred soils on uplands. Included areas make up about 20 percent of the total acreage.

The Judith soil is deep and well drained. It formed in alluvium derived dominantly from limestone. Typically, the surface layer is dark grayish brown gravelly clay loam about 6 inches thick. The upper 11 inches of the subsoil is brown and very pale brown clay loam, and the lower 7 inches is white clay loam. The upper 22 inches of the substratum is very pale brown extremely gravelly loam, and the lower part to a depth of 66 inches or more is very pale brown extremely gravelly sandy clay loam.

Permeability of the Judith soil is moderate to a depth of 24 inches and moderately rapid below this depth. Available water capacity is moderate. Effective rooting depth is 66 inches or more. The average annual wetting depth where this soil is under native vegetation is about 30 inches. Runoff is medium, and the hazard of water erosion is high. The hazard of soil blowing is high.

The Windham soil is deep and well drained. It formed in alluvium derived dominantly from limestone. Typically, the surface layer is dark grayish brown gravelly clay loam about 6 inches thick. The subsoil is pale brown gravelly clay loam about 6 inches thick. The upper 6 inches of the substratum is white very gravelly loam, and the lower part to a depth of 60 inches or more is very pale brown extremely gravelly loam.

Permeability of the Windham soil is moderate to a depth of 18 inches and moderately rapid below this

depth. Available water capacity is very low to low. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is about 30 inches. Runoff is medium, and the hazard of water erosion is high. The hazard of soil blowing is high.

The soils in this unit are used mainly as rangeland and for hay and pasture.

These soils are poorly suited for nonirrigated crops because of the hazards of water erosion and soil blowing and the very low to low available water capacity of the Windham soil.

These soils are suited to hay and pasture. They are limited mainly by the hazards of soil blowing and water erosion, the very low to moderate available water capacity, and the presence of pebbles and cobbles in the surface layer. Seedbed preparation and planting on the contour or across the slope, where practical, help to control soil blowing and water erosion. All adapted pasture plants can be grown, but bunch-type species planted alone generally are not suitable because of the hazard of erosion. Grasses and legumes grow well if adequate fertilizer is used.

The potential plant community on the Judith soil is mainly bluebunch wheatgrass, green needlegrass, western wheatgrass, and Idaho fescue. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of Idaho fescue, plains reedgrass, Sandberg bluegrass, and blue grama increases. If excessive grazing continues, plants such as broom snakeweed, Kentucky bluegrass, perennial weeds, and annuals may invade. The potential plant community produces about 2,300 pounds of air-dry vegetation in years of above-normal precipitation and 1,700 pounds in years of below-normal precipitation.

The potential plant community on the Windham soil is mainly bluebunch wheatgrass, western wheatgrass, green needlegrass, and needleandthread. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of needleandthread, blue grama, fringed sagewort, and wild rose increases. If excessive grazing continues, plants such as broom snakeweed, clubmoss, perennial weeds, and annuals may invade. The potential plant community produces about 1,400 pounds of air-dry vegetation in years of above-normal precipitation and 700 pounds in years of below-normal precipitation.

These soils are suitable for seeding to adapted grasses and forbs if the range is in poor condition. Seedbed preparation and planting on the contour or across the slope, where practical, conserve moisture and help to control water erosion. The surface layer is susceptible to water erosion and soil blowing if it is disturbed or if the range is overgrazed.

These soils are suited to windbreaks, but the high concentration of lime at a depth of less than 15 inches and the limited moisture supply restrict the choice of trees and shrubs. Suitable trees for planting are Russian-olive, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, and skunkbush sumac. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings. Planting on the contour helps to conserve moisture.

The main limitations for homesite development on the soils in this unit are potential frost action, content of rock fragments, and low soil strength. Slope is a concern in installing septic tank absorption fields. Absorption lines should be installed on the contour. Frost action and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. The very gravelly or extremely gravelly material below a depth of about 12 inches is good roadfill. Removal of pebbles and cobbles in disturbed areas is needed for best results when landscaping, particularly in areas used for lawns. Lawn grasses, shrubs, and trees that are not sensitive to lime-induced chlorosis are well suited to use in landscaping. An annual application of iron chelates reduces the chlorosis.

This map unit is in capability subclass IVe, nonirrigated. The Judith soil is in Clayey range site, 15- to 19-inch precipitation zone, and the Windham soil is in Limy range site, 15- to 19-inch precipitation zone.

135—Julin-Dilts clays, 2 to 25 percent slopes. This map unit is on uplands in the east-central and northeastern parts of the county. Slopes commonly are 250 to 1,000 feet long. Elevation is 2,200 to 3,800 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 44 degrees F, and the average frost-free period is about 130 days.

This unit is about 60 percent Julin clay and 30 percent Dilts clay. The Julin soil is on plane side slopes, and the Dilts soil is on ridges and knolls.

Included in this unit is about 10 percent shallow Neldore soils on ridges and knolls.

The Julin soil is moderately deep and well drained. It formed in residuum derived dominantly from consolidated shale. Typically, the surface layer is gray clay about 7 inches thick. The underlying material is gray silty clay 23 inches thick. Gray shale is at a depth of about 30 inches. Depth to shale ranges from 20 to 40 inches.

Permeability of the Julin soil is slow. Available water capacity is very low to low. Effective rooting depth is 20 to 40 inches. The average annual wetting depth where this soil is under native vegetation is 20 to 22 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is high.

The Dilts soil is shallow and well drained. It formed in residuum derived dominantly from consolidated shale. Typically, the surface layer is light brownish gray clay

about 3 inches thick. The underlying material is light brownish gray and grayish brown clay about 12 inches thick. Gray shale is at a depth of about 15 inches. Depth to shale ranges from 10 to 20 inches.

Permeability of the Dilts soil is very slow. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. The average annual wetting depth where this soil is under native vegetation is 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is high.

The soils in this unit are used as rangeland.

These soils are poorly suited to cultivated crops and to hay and pasture because of the hazards of soil blowing and water erosion and the shallow and moderate depth to shale.

The potential plant community on the Julin soil is mainly western wheatgrass, thickspike wheatgrass, prairie sandreed, and wild rose. If the range is excessively grazed, the proportion of these plants decreases and the proportion of plains reedgrass, goldenrod, longleaf sagebrush, and big sagebrush increases. If excessive grazing continues, plants such as goldenpea, annuals, perennial weeds, and creeping juniper may invade. The potential plant community produces about 900 pounds of air-dry vegetation in years of above-normal precipitation and 400 pounds in years of below-normal precipitation.

The potential plant community on the Dilts soil is mainly western wheatgrass, prairie sandreed, thickspike wheatgrass, and plains reedgrass. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of plains reedgrass, prairie junegrass, longleaf sagebrush, and creeping juniper increases. If excessive grazing continues, plants such as goldenpea, creeping juniper, perennial weeds, and annuals may invade. The potential plant community produces about 700 pounds of air-dry vegetation in years of above-normal precipitation and 300 pounds in years of below-normal precipitation.

The surface layer of these soils is susceptible to water erosion and soil blowing if it is disturbed or if the range is overgrazed. Mechanical treatment is not practical because of the dissection caused by drainage and the hazards of water erosion and soil blowing.

These soils are poorly suited to windbreaks. They are limited mainly by the very low available water capacity.

The main limitations for homesite development on the soils in this unit are slow and very slow permeability, slope, moderate and shallow depth to shale, shrink-swell potential, and low soil strength. These soils are severely limited for septic tank absorption fields because of the slow and very slow permeability, slope, and moderate and shallow depth to shale. Cuts to level building sites can expose shale. Shrinking and swelling and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential.

This map unit is in capability subclass VIe, nonirrigated. The Julin soil is in Clayey range site, 10- to 14-inch precipitation zone, and the Dilts soil is in Shallow Clay range site, 10- to 14-inch precipitation zone.

136—Kildor clay loam, 2 to 15 percent slopes. This moderately deep, well drained soil is on uplands in the south-central part of the county. It formed in alluvium and residuum derived from semiconsolidated shale. Slopes commonly are 250 to 1,000 feet long. Elevation is 4,600 to 6,000 feet. The average annual precipitation is about 22 inches, the average annual air temperature is about 40 degrees F, and the average frost-free period is about 70 days.

Included in this unit are small areas of moderately deep Castle soils on knolls and deep Burnette soils on concave side slopes and fans.

Typically, the surface layer of this Kildor soil is grayish brown loam about 2 inches thick. The next layer is dark grayish brown clay loam about 3 inches thick. The upper 8 inches of the subsoil is light olive gray clay, and the lower 24 inches is pale olive and light olive gray silty clay. Pale olive and olive shale is at a depth of about 37 inches. Depth to shale ranges from 20 to 40 inches.

Permeability is slow. Available water capacity is low to moderate. Effective rooting depth is 20 to 40 inches. The average annual wetting depth where this soil is under native vegetation is 20 to 40 inches. Runoff is medium to rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

This soil is used as rangeland, for hay and pasture, and for nonirrigated crops such as wheat, barley, and oats.

This soil is suited to nonirrigated crops. It is limited mainly by the short growing season and the hazards of water erosion and soil blowing. Timeliness is of prime importance in all tillage, seeding, and harvesting operations. Minimum tillage, contour cultivation, grassed waterways, stubble-mulch tillage, and growing sod crops such as hay and pasture help to control soil blowing and water erosion.

The potential plant community on this soil is mainly rough fescue, bearded wheatgrass, mountain brome, and Columbia needlegrass. If the range is excessively grazed, the proportion of these plants decreases and the proportion of Idaho fescue, western wheatgrass, lupine, and shrubby cinquefoil increases. If excessive grazing continues, plants such as Kentucky bluegrass, timothy, perennial forbs, and annuals may invade. The potential plant community produces about 3,300 pounds of air-dry vegetation in years of above-normal precipitation and 2,300 pounds in years of below-normal precipitation.

This soil is suitable for seeding to adapted grasses and forbs if the range is in poor condition. Seedbed preparation and planting on the contour or across the slope, where practical, conserve moisture and help to control water erosion. The surface layer is susceptible to water erosion and soil blowing if it is disturbed or if the range is overgrazed.

This soil is suited to windbreaks, but the low to moderate available water capacity limits the growth of both trees and shrubs. Suitable trees for planting are Russian-olive, Siberian crabapple, green ash, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and cotoneaster. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings. Planting on the contour helps to conserve moisture.

The main limitations for homesite development on this soil are slow permeability, moderate depth to shale, shrink-swell potential, potential frost action, and low soil strength. The soil is severely limited for septic tank absorption fields because of the slow permeability and the moderate depth to shale. Cuts to level building sites can expose shale. Shrinking and swelling, frost action, and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential.

This map unit is in capability subclass IVe, nonirrigated, and in Clayey range site, 20- to 24-inch precipitation zone.

137—Kildor-Sheege complex, 25 to 60 percent slopes. This map unit is on uplands in the south-central part of the county. Slopes commonly are 250 to 1,000 feet long. Elevation is 4,600 to 6,000 feet. The average annual precipitation is about 22 inches, the average annual air temperature is about 40 degrees F, and the average frost-free period is about 70 days.

This unit is about 55 percent Kildor clay loam and 25 percent Sheege channery loam. The Kildor soil is on both convex and plane side slopes, and the Sheege soil is on ridges. The Kildor soil has slopes of 25 to 45 percent, and the Sheege soil has slopes of 25 to 60 percent.

Included in this unit are small areas of moderately deep Skaggs soils on backslopes, deep Hoosan soils on foot slopes and fans, and Rock outcrop on ridge crests. Included areas make up about 20 percent of the total acreage.

The Kildor soil is moderately deep and well drained. It formed in alluvium and residuum derived dominantly from semiconsolidated shale. Typically, the surface layer is grayish brown loam about 2 inches thick. The next layer is dark grayish brown clay loam about 3 inches thick. The upper 8 inches of the subsoil is light olive gray clay, and the lower 24 inches is pale olive and light olive gray silty clay. Pale olive shale is at a depth of about 37 inches. Depth to shale ranges from 20 to 40 inches.

Permeability of the Kildor soil is slow. Available water capacity is low to moderate. Effective rooting depth is 20 to 40 inches. The average annual wetting depth where this soil is under native vegetation is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

The Sheege soil is shallow and well drained. It formed in residuum derived dominantly from fractured hard limestone. Typically, the surface layer is dark gray channery loam about 6 inches thick. The underlying material is pale brown very channery loam about 6 inches thick. Limestone is at a depth of about 12 inches. Depth to limestone ranges from 10 to 20 inches.

Permeability of the Sheege soil is moderate. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. The average annual wetting depth where this soil is under native vegetation is 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

The soils in this unit are used as rangeland.

These soils are poorly suited to cultivated crops and to hay and pasture because of steepness of slope and rough topography.

The potential plant community on the Kildor soil is mainly rough fescue, bearded wheatgrass, mountain brome, and Columbia needlegrass. If the range is excessively grazed, the proportion of these plants decreases and the proportion of Idaho fescue, western wheatgrass, lupine, and shrubby cinquefoil increases. If excessive grazing continues, plants such as Kentucky bluegrass, timothy, perennial forbs, and annuals may invade. The potential plant community produces about 3,300 pounds of air-dry vegetation in years of above-normal precipitation and 2,300 pounds in years of below-normal precipitation.

The potential plant community on the Sheege soil is mainly bluebunch wheatgrass, western wheatgrass, bearded wheatgrass, and Columbia needlegrass. If the range is excessively grazed, the proportion of these plants decreases and the proportion of Idaho fescue, big sagebrush, Sandberg bluegrass, and eriogonum increases. If excessive grazing continues, plants such as broom snakeweed, perennial forbs, and annuals may invade. The potential plant community produces about 1,200 pounds of air-dry vegetation in years of above-normal precipitation and 700 pounds in years of below-normal precipitation.

The surface layer is susceptible to water erosion and soil blowing if it is disturbed or if the range is overgrazed. These soils are not suitable for mechanical treatment because of steepness of slope and rough topography.

These soils are poorly suited to windbreaks. They are limited mainly by slope.

The soils in this unit are poorly suited to homesite development because of steepness of slope and moderate and shallow depth to shale and limestone.

This map unit is in capability subclass VIIe, nonirrigated. The Kildor soil is in Clayey range site, 20- to 24-inch precipitation zone, and the Sheege soil is in Shallow range site, 20- to 24-inch precipitation zone.

138—Kildor-Skaggs-Hanson complex, 15 to 45 percent slopes. This map unit is on uplands in the south-central part of the county. Slopes commonly are 250 to 1,000 feet long. Elevation is 4,600 to 6,000 feet. The average annual precipitation is about 22 inches, the average annual air temperature is about 40 degrees F, and the average frost-free period is about 70 days.

This unit is about 45 percent Kildor clay loam, 20 percent Skaggs stony loam, and 20 percent Hanson stony loam. The Kildor and Skaggs soils are on plane and convex side slopes, and the Hanson soil is on foot slopes.

Included in this unit is about 15 percent moderately deep Castle soils.

The Kildor soil is deep and well drained. It formed in alluvium and residuum derived dominantly from semiconsolidated shale. Typically, the surface layer is grayish brown loam about 2 inches thick. The next layer is dark grayish brown clay loam about 3 inches thick. The upper 8 inches of the subsoil is light olive gray clay, and the lower 24 inches is pale olive and light olive gray silty clay. Pale olive and olive shale is at a depth of about 37 inches. Depth to shale ranges from 20 to 40 inches.

Permeability of the Kildor soil is slow. Available water capacity is low to moderate. Effective rooting depth is 20 to 40 inches. The average annual wetting depth where this soil is under native vegetation is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

The Skaggs soil is moderately deep and well drained. It formed in residuum derived dominantly from fractured hard limestone. Typically, the surface layer is very dark grayish brown stony loam about 8 inches thick. The upper 16 inches of the underlying material is light gray and white very gravelly loam, and the lower 8 inches is pale yellow very gravelly clay loam. Limestone is at a depth of about 32 inches. Depth to limestone ranges from 20 to 40 inches.

Permeability of the Skaggs soil is moderate. Available water capacity is low. Effective rooting depth is 20 to 40 inches. The average annual wetting depth where this soil is under native vegetation is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

The Hanson soil is deep and well drained. It formed in alluvium and colluvium derived dominantly from limestone. Typically, the surface layer is very dark grayish brown stony loam about 11 inches thick. The next layer is dark grayish brown cobbly clay loam about 4 inches thick. The underlying material to a depth of 62 inches or more is pale brown and very pale brown extremely gravelly clay loam.

Permeability of the Hanson soil is moderate. Available water capacity is moderate. Effective rooting depth is 62 inches or more. The average annual wetting depth where this soil is under native vegetation is 62 inches or more. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

The soils in this unit are used as rangeland.

These soils are poorly suited to cultivated crops and to hay and pasture because of steepness of slope and rough topography.

The potential plant community on the Kildor soil is mainly rough fescue, bearded wheatgrass, mountain brome, and Columbia needlegrass. If the range is excessively grazed, the proportion of these plants decreases and the proportion of Idaho fescue, western wheatgrass, lupine, and shrubby cinquefoil increases. If excessive grazing continues, plants such as Kentucky bluegrass, timothy, perennial forbs, and annuals may invade. The potential plant community produces about 3,300 pounds of air-dry vegetation in years of above-normal precipitation and 2,300 pounds in years of below-normal precipitation.

The potential plant community on the Skaggs and Hanson soils is mainly rough fescue, bluebunch wheatgrass, Columbia needlegrass, and mountain brome. If the range is excessively grazed, the proportion of these plants decreases and the proportion of Idaho fescue, western wheatgrass, Letterman needlegrass, and spikeoat increases. If excessive grazing continues, plants such as timothy, Kentucky bluegrass, onespike danthonia, and perennial forbs may invade. The potential plant community produces about 3,400 pounds of air-dry vegetation in years of above-normal precipitation and 2,500 pounds in years of below-normal precipitation.

The surface layer is susceptible to water erosion and soil blowing if it is disturbed or if the range is overgrazed. These soils are not suitable for mechanical treatment because of steepness of slope and rough topography.

These soils are poorly suited to windbreaks. They are limited mainly by slope.

The main limitations for homesite development on the Kildor soil are slow permeability, slope, moderate depth to shale, shrink-swell potential, potential frost action, and low soil strength. This soil is severely limited for septic tank absorption fields because of slope, slow permeability, and moderate depth to shale. Cuts to level building sites can expose shale. Shrinking and swelling, frost action, and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of

basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential.

The main limitations for homesite development on the Skaggs and Hanson soils are slope, potential frost action, content of rock fragments, low soil strength, and moderate depth to limestone in the Skaggs soil. These soils are severely limited for septic tank absorption fields because of slope and moderate depth to limestone in the Skaggs soil. Cuts to level building sites can expose limestone in the Skaggs soil. Frost action and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. Removal of pebbles and cobbles in disturbed areas is needed for best results when landscaping, particularly in areas used for lawns.

This map unit is in capability subclass VIe, nonirrigated. The Kildor soil is in Clayey range site, 20- to 24-inch precipitation zone, and the Skagg and Hanson soils are in Silty range site, 20- to 24-inch precipitation.

139—Klayent clay loam, 0 to 2 percent slopes. This deep, somewhat poorly drained soil is on flood plains. It formed in alluvium derived from mixed rock sources. Slopes commonly are more than 1,000 feet long. Elevation is 2,400 to 3,500 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 44 degrees F, and the average frost-free period is about 130 days.

Included in this unit are small areas of deep, well drained Harlem soils. Also included are small areas of salt- and alkali-affected soils.

Typically, the surface layer of this Klayent soil is very dark grayish brown clay loam about 5 inches thick. The upper 9 inches of the subsoil is very dark gray clay, and the lower 9 inches is grayish brown and dark grayish brown clay. The upper 7 inches of the substratum is gray clay, the next 12 inches is gray clay loam stratified with thin lenses of clay, and the lower part to a depth of 66 inches or more is greenish gray sandy clay loam stratified with thin lenses of loam and sandy clay.

Permeability is slow. Available water capacity is high. Effective rooting depth is 66 inches or more. The average annual wetting depth where this soil is under native vegetation is 66 inches or more. A seasonal high water table is at a depth of 24 to 36 inches in spring and early in summer. Runoff is slow, and the hazard of water erosion is slight except during periods of rare flooding. The hazard of soil blowing is high.

This soil is used mainly as rangeland. It is also used for hay and pasture.

This soil is poorly suited to cultivated crops because of the seasonal high water table and wetness.

This soil is suited to hay and pasture. It is limited mainly by the seasonal high water table at a depth of 24 to 36 inches and the hazards of flooding and soil blowing. Wetness limits the choice of plants, limits the period of cutting or grazing, and increases the risk of winterkill. Maintaining a good plant cover on this soil helps to control soil blowing and reduces water erosion during floods.

The potential plant community on this soil is mainly slender wheatgrass, prairie cordgrass, basin wildrye, and western wheatgrass. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of western wheatgrass, willow, mat muhly, and shrubby cinquefoil increases. If excessive grazing continues, plants such as Kentucky bluegrass, smooth brome, arrowgrass, and perennial weeds may invade. The potential plant community produces about 3,500 pounds of air-dry vegetation in years of above-normal precipitation and 2,800 pounds in years of below-normal precipitation.

Mechanical treatment is limited because of the seasonal high water table and wetness. Grazing should be delayed until the soil has drained sufficiently and is firm enough to withstand trampling by livestock.

This soil is suited to windbreaks, but the seasonal high water table limits the choice of trees and shrubs to those that are water tolerant. Suitable trees for planting are Russian-olive, Siberian crabapple, green ash, Siberian elm, white willow, golden willow, plains cottonwood, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Tatarian honeysuckle, common chokecherry, lilac, skunkbush sumac, purpleosier willow, silver buffaloberry, and redosier dogwood. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings.

The hazard of rare flooding, the seasonal high water table, wetness, and the possibility of streams changing channels make homesite development on this soil impractical.

This map unit is in capability subclass VIw, nonirrigated, and in Subirrigated range site, 10- to 14-inch precipitation zone.

140—Kobar silty clay loam, 0 to 2 percent slopes. This deep, well drained soil is on terraces in the eastern and northern parts of the county. It formed in alluvium. Slopes commonly are more than 1,000 feet long. Elevation is 2,200 to 3,600 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 44 degrees F, and the average frost-free period is about 130 days.

Included in this unit are small areas of deep Yamac soils on fans.

Typically, the surface layer of this Kobar soil is grayish brown silty clay loam about 7 inches thick. The subsoil is light brownish gray silty clay loam about 13 inches thick. The substratum to a depth of 60 inches or more is light brownish gray clay loam.

Permeability is slow. Available water capacity is high. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is about 22 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

This soil is used mainly for nonirrigated crops such as wheat, barley, and oats. It is also used for hay and pasture and as rangeland.

This soil is well suited to nonirrigated crops. It is limited mainly by low precipitation and the hazard of soil blowing. Because precipitation is not sufficient for annual cropping, a cropping system that includes small grains and summer fallow is best. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, stubble-mulch tillage, and growing sod crops such as hay and pasture help to control soil blowing.

The potential plant community on this soil is mainly western wheatgrass, green needlegrass, bluebunch wheatgrass, and thickspike wheatgrass. If the range is excessively grazed, the proportion of these plants decreases and the proportion of plains reedgrass, blue grama, Sandberg bluegrass, and fringed sagewort increases. If excessive grazing continues, plants such as perennial weeds, broom snakeweed, annuals, and clubmoss may invade. The potential plant community produces about 1,400 pounds of air-dry vegetation in years of above-normal precipitation and 800 pounds in years of below-normal precipitation.

This soil is suitable for seeding to adapted grasses and forbs if the range is in poor condition. The surface layer is susceptible to soil blowing if it is disturbed or if the range is overgrazed.

This soil is well suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian crabapple, green ash, Siberian elm, white willow, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and cotoneaster. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings.

The main limitations for homesite development on this soil are slow permeability, shrink-swell potential, and low soil strength. If the soil is used for septic tank absorption fields, the slow permeability can be overcome by increasing the size of the absorption field. Shrinking and swelling and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential.

This map unit is in capability subclass IIIe, nonirrigated, and in Clayey range site, 10- to 14-inch precipitation zone.

141—Kobar silty clay loam, 2 to 8 percent slopes. This deep, well drained soil is on terraces and fans in the eastern and northern parts of the county. It formed in alluvium. Slopes commonly are 1,000 feet long. Elevation is 2,200 to 3,600 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 44 degrees F, and the average frost-free period is about 130 days.

Included in this unit are small areas of deep Yamac soils on fans.

Typically, the surface layer of this Kobar soil is grayish brown silty clay loam about 7 inches thick. The subsoil is light brownish gray silty clay loam about 13 inches thick. The substratum to a depth of 60 inches or more is light brownish gray clay loam.

Permeability is slow. Available water capacity is high. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is about 22 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

This soil is used mainly for nonirrigated crops such as wheat, barley, and oats. It is also used for hay and pasture and as rangeland.

This soil is well suited to nonirrigated crops. It is limited mainly by low precipitation and the hazards of water erosion and soil blowing. Because precipitation is not sufficient for annual cropping, a cropping system that includes small grains and summer fallow is best. Minimum tillage, contour cultivation, grassed waterways, stripcropping, and growing sod crops such as hay and pasture help to control soil blowing and water erosion. Crop residue left on or near the surface helps to conserve moisture, increases the water intake rate, and improves tilth.

The potential plant community on this soil is mainly western wheatgrass, green needlegrass, bluebunch wheatgrass, and thickspike wheatgrass. If the range is excessively grazed, the proportion of these plants decreases and the proportion of plains reedgrass, blue grama, Sandberg bluegrass, and fringed sagewort increases. If excessive grazing continues, plants such as perennial weeds, broom snakeweed, annuals, and clubmoss may invade. The potential plant community produces about 1,400 pounds of air-dry vegetation in years of above-normal precipitation and 800 pounds in years of below-normal precipitation.

Where clubmoss and blue grama are the dominant vegetation, pitting, furrowing, chiseling, or other mechanical treatment practices can be used to improve depleted rangeland. This soil is suitable for seeding to adapted grasses and forbs if the range is in poor condition. Seedbed preparation and planting on the contour or across the slope, where practical, conserve moisture and help to control water erosion. The surface layer is susceptible to water erosion and soil blowing if it is disturbed or if the range is overgrazed.

This soil is well suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian crabapple, green ash, Siberian elm, white willow, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and cotoneaster. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings.

The main limitations for homesite development on this soil are slow permeability, shrink-swell potential, and low soil strength. If this soil is used for septic tank absorption fields, the slow permeability can be overcome by increasing the size of the absorption field. Shrinking and swelling and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential.

This map unit is in capability subclass IIIe, nonirrigated, and in Clayey range site, 10- to 14-inch precipitation zone.

142—Kobar silty clay loam, gullied, 2 to 25 percent slopes. This deep, well drained soil is on fans in the eastern and northern parts of the county. It formed in alluvium. Slopes commonly are less than 250 feet long. Elevation is 2,200 to 3,600 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 44 degrees F, and the average frost-free period is about 130 days.

Included in this unit are small areas of deep Yamac soils on dissected fans and deep, clayey and loamy soils on steep to very steep side slopes. Also included are small areas of deep Havre and Harlem soils and somewhat poorly drained soils along narrow drainageways. Included areas make up about 25 percent of the total acreage.

Typically, the surface layer of this Kobar soil is grayish brown silty clay loam about 7 inches thick. The subsoil is light brownish gray silty clay loam about 13 inches thick. The substratum to a depth of 60 inches or more is light brownish gray clay loam.

Permeability is slow. Available water capacity is high. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is about 22 inches. Runoff is medium to rapid, and the hazard of water erosion is moderate to high. The hazard of soil blowing is moderate.

This soil is used as rangeland.

This soil is poorly suited to cultivated crops and to hay and pasture because of steepness of slope and rough topography.

The potential plant community on this soil is mainly western wheatgrass, green needlegrass, bluebunch wheatgrass, and thickspike wheatgrass. If the range is excessively grazed, the proportion of these plants decreases and the proportion of plains reedgrass, blue grama, Sandberg bluegrass, and fringed sagewort increases. If excessive grazing continues, plants such as perennial weeds, broom snakeweed, annuals, and clubmoss may invade. The potential plant community produces about 1,400 pounds of air-dry vegetation in years of above-normal precipitation and 800 pounds in years of below-normal precipitation.

The surface layer is susceptible to water erosion and soil blowing if it is disturbed or the range is overgrazed. The soil is not suitable for mechanical treatment because of slope and rough topography.

This soil is not suited to windbreaks. It is limited mainly by slope.

The main limitations for homesite development on this soil are the dissected topography, slow permeability, slope, shrink-swell potential, and low soil strength. If the soil is used for septic tank absorption fields, the slow permeability and slope can be overcome by increasing the length of absorption lines and installing them on the contour. Shrinking and swelling and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential.

This map unit is in capability subclass VIIe, nonirrigated, and in Clayey range site, 10- to 14-inch precipitation zone.

143—Korchea loam. This deep, well drained soil is on flood plains in the central and western parts of the county. It formed in alluvium derived from mixed rock sources. Slope ranges from 0 to 2 percent. Slopes commonly are more than 1,000 feet long. Elevation is 3,400 to 3,800 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 120 days.

Included in this unit are small areas of deep Sudworth soils that are underlain by sand and gravel at a depth of 20 to 30 inches.

Typically, the surface layer of this Korchea soil is dark grayish brown loam about 7 inches thick. The upper 17 inches of the underlying material is grayish brown loam stratified with silt loam and fine sandy loam, the next 30 inches is grayish brown loam stratified with silt loam and very fine sandy loam, and the lower part to a depth of 66 inches or more is grayish brown loam stratified with silt loam.

Permeability is moderate. Available water capacity is high. Effective rooting depth is 66 inches or more. The average annual wetting depth where this soil is under

native vegetation is about 30 inches. Runoff is slow, and the hazard of water erosion is slight except during periods of rare flooding. The hazard of soil blowing is moderate.

This soil is used mainly for hay and pasture and nonirrigated crops such as wheat, barley, and oats. It is also used as rangeland.

This soil is well suited to nonirrigated crops. It is limited mainly by low precipitation and the hazards of flooding, streambank cutting, and soil blowing. Soil blowing can be reduced by returning crop residue to the soil and practicing minimum tillage. Growing sod crops such as hay and pasture also helps to control soil blowing and reduces water erosion during periods of flooding.

The potential plant community on this soil is mainly bluebunch wheatgrass, green needlegrass, western wheatgrass, and needleandthread. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of western wheatgrass, needleandthread, Sandberg bluegrass, and blue grama increases. If excessive grazing continues, plants such as Kentucky bluegrass, timothy, clubmoss, and perennial weeds may invade. The potential plant community produces about 1,800 pounds of air-dry vegetation in years of above-normal precipitation and 1,000 pounds in years of below-normal precipitation.

This soil is suitable for seeding to adapted grasses and forbs if the range is in poor condition. The surface layer is susceptible to water erosion during periods of flooding and to soil blowing if it is disturbed or if the range is overgrazed.

This soil is well suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian crabapple, green ash, Siberian elm, white willow, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and cotoneaster. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings.

The hazards of rare flooding and streambank cutting make homesite development on this soil impractical.

This map unit is in capability subclass IIIe, nonirrigated, and in Silty range site, 15- to 19-inch precipitation zone.

144—Korchea and Frazer soils, occasionally flooded. This map unit is on flood plains in the western and central parts of the county. Slope ranges from 0 to 2 percent. Slopes commonly are 250 to 1,000 feet long. Elevation is 3,400 to 3,800 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 120 days.

The percentage of these two soils varies greatly from one area to another.

Included in this unit are small areas of soils that are similar to the Korchea and Frazer soils but are deep fine sandy loams.

The Korchea soil is deep and well drained. It formed in alluvium derived from mixed rock sources. Typically, the surface layer is dark grayish brown loam about 7 inches thick. The upper 17 inches of the underlying material is grayish brown loam stratified with silt loam and fine sandy loam, the next 30 inches is grayish brown loam stratified with silt loam and very fine sandy loam, and the lower part to a depth of 66 inches or more is grayish brown loam stratified with silt loam.

Permeability of the Korchea soil is moderate. Available water capacity is high. Effective rooting depth is 66 inches or more. The average annual wetting depth where this soil is under native vegetation is about 30 inches. Runoff is slow, and the hazard of water erosion is slight except during periods of occasional flooding. The hazard of soil blowing is moderate.

The Frazer soil is deep and well drained. It formed in alluvium derived from mixed rock sources. Typically, the surface layer is grayish brown silty clay loam about 6 inches thick. The upper 16 inches of the underlying material is grayish brown silty clay loam, the next 12 inches is grayish brown silty clay, and the lower part to a depth of 60 inches or more is grayish brown silty clay loam.

Permeability of the Frazer soil is slow. Available water capacity is high. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is about 22 inches. Runoff is slow, and the hazard of water erosion is slight except during periods of occasional flooding. The hazard of soil blowing is moderate.

The soils in this unit are used as rangeland.

These soils are poorly suited to cultivated crops and to hay and pasture because of dissection by drainageways and the hazard of flooding.

The potential plant community on these soils is mainly western wheatgrass, green needlegrass, slender wheatgrass, and basin wildrye. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of western wheatgrass, prairie junegrass, needleandthread, and silver sagebrush increases. If excessive grazing continues, plants such as Kentucky bluegrass, clubmoss, pricklypear, and curlycup gumweed may invade. The potential plant community produces about 2,500 pounds of air-dry vegetation in years of above-normal precipitation and 1,200 pounds in years of below-normal precipitation.

The surface layer is susceptible to water erosion during floods and to soil blowing if it is disturbed or if the range is overgrazed. Mechanical treatment is limited because of dissection by drainageways, susceptibility to flooding, and the hazard of water erosion. Maintaining a good plant cover on the soils helps to control erosion during floods and reduces soil blowing.

These soils are well suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian crabapple, green ash, Siberian elm, white willow, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and cotoneaster. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings.

The hazards of occasional flooding and the possibility of streams changing channel make homesite development on these soils impractical.

This map unit is in capability subclass VIw, nonirrigated, and in Overflow range site, 15- to 19-inch precipitation zone.

145—Lawther silty clay, 0 to 2 percent slopes. This deep, well drained soil is on terraces and fans in the western and central parts of the county. It formed in alluvium derived dominantly from shale. Slopes commonly are more than 1,000 feet long. Elevation is 3,200 to 4,000 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 120 days.

Included in this unit are small areas of deep, salt- and alkali-affected Adger soils.

Typically, the surface layer of this Lawther soil is grayish brown silty clay about 6 inches thick. The subsoil is light grayish brown silty clay about 14 inches thick. The substratum to a depth of 64 inches or more is light grayish brown clay.

Permeability is slow. Available water capacity is high. Effective rooting depth is 64 inches or more. The average annual wetting depth where this soil is under native vegetation is about 26 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high.

This soil is used mainly for nonirrigated crops such as wheat, barley, and oats. It is also used for hay and pasture and as rangeland.

This soil is well suited to nonirrigated crops. It is limited mainly by the hazard of soil blowing and low precipitation. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, stubble-mulch tillage, and growing sod crops such as hay and pasture help to control soil blowing. Return of crop residue to the soil helps to maintain good tilth.

The potential plant community on this soil is mainly western wheatgrass, bluebunch wheatgrass, green needlegrass, and basin wildrye. If the range is excessively grazed, the proportion of these plants decreases and the proportion of Sandberg bluegrass, plains reedgrass, Idaho fescue, and blue grama increases. If excessive grazing continues, plants such as Kentucky bluegrass, broom snakeweed, perennial weeds, and annuals may invade. The potential plant community produces about 2,000 pounds of air-dry vegetation in years of above-normal precipitation and 1,400 pounds in years of below-normal precipitation.

This soil is suitable for seeding to adapted grasses and forbs if the range is in poor condition. The surface layer is susceptible to soil blowing if it is disturbed or if the range is overgrazed.

This soil is well suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian crabapple, green ash, Siberian elm, white willow, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and cotoneaster. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings.

The main limitations for homesite development on this soil are slow permeability, shrink-swell potential, and low soil strength. If the soil is used for septic tank absorption fields, the slow permeability can be overcome by increasing the size of the absorption field. Shrinking and swelling and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential.

This map unit is in capability subclass IIIe, nonirrigated, and in Clayey range site, 15- to 19-inch precipitation zone.

146—Lawther silty clay, 2 to 4 percent slopes. This deep, well drained soil is on terraces and fans in the western and central parts of the county. It formed in alluvium derived dominantly from shale. Slopes commonly are 250 to 1,000 feet long. Elevation is 3,200 to 4,000 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 120 days.

Included in this unit are small areas of soils that have slopes of 4 to 8 percent.

Typically, the surface layer of this Lawther soil is grayish brown silty clay about 6 inches thick. The subsoil is light grayish brown silty clay about 14 inches thick. The substratum to a depth of 64 inches or more is light grayish brown clay.

Permeability is slow. Available water capacity is high. Effective rooting depth is 64 inches or more. The average annual wetting depth where this soil is under native vegetation is about 26 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high.

This soil is used mainly for nonirrigated crops such as wheat, barley, and oats. It is also used for hay and pasture and as rangeland.

This soil is well suited to nonirrigated crops. It is limited mainly by the hazards of soil blowing and water erosion and by low precipitation. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, stubble-mulch tillage, grassed waterways, and growing sod crops such as hay and pasture help to control soil blowing and water erosion. Returning crop residue to the soil helps to maintain good tilth.

The potential plant community on this soil is mainly western wheatgrass, bluebunch wheatgrass, green needlegrass, and basin wildrye. If the range is excessively grazed, the proportion of these plants decreases and the proportion of Sandberg bluegrass, plains reedgrass, Idaho fescue, and blue grama increases. If excessive grazing continues, plants such as Kentucky bluegrass, broom snakeweed, perennial weeds, and annuals may invade. The potential plant community produces about 2,000 pounds of air-dry vegetation in years of above-normal precipitation and 1,400 pounds in years of below-normal precipitation.

This soil is suitable for seeding to adapted grasses and forbs if the range is in poor condition. Seedbed preparation and planting on the contour or across the slope, where practical, conserve moisture and help to control water erosion. The surface layer is susceptible to water erosion and soil blowing if it is disturbed or if the range is overgrazed.

This soil is well suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian crabapple, green ash, Siberian elm, white willow, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and cotoneaster. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings.

The main limitations for homesite development on this soil are slow permeability, shrink-swell potential, and low soil strength. If the soil is used for septic tank absorption fields, the slow permeability can be overcome by increasing the size of the absorption field. Shrinking and swelling and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential.

This map unit is in capability subclass IIIe, nonirrigated, and in Clayey range site, 15- to 19-inch precipitation zone.

147—Libeg flaggy loam, 15 to 45 percent slopes. This deep, well drained soil is on mountainsides in the central part of the county. It formed in colluvium and alluvium derived dominantly from sandstone and igneous rock. Slopes commonly are more than 1,000 feet long. Elevation is 4,800 to 6,500 feet. The average annual precipitation is about 22 inches, the average annual air temperature is about 40 degrees F, and the average frost-free period is about 70 days.

Included in this unit are small areas of deep Tigeron soils on wooded north-facing side slopes, small areas of Libeg very flaggy loam on plane side slopes, and small areas of Rock outcrop on ridge crests.

Typically, the surface layer of this Libeg soil is dark brown flaggy loam about 5 inches thick. The next layer is brown very flaggy loam about 6 inches thick. The upper 6 inches of the subsoil is pale brown extremely flaggy clay loam, and the lower part to a depth of 60 inches or more is yellowish brown and light yellowish brown extremely flaggy clay loam.

Permeability is moderate. Available water capacity is low. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is 60 inches or more. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

This soil is used as rangeland.

This soil is poorly suited to cultivated crops and to hay and pasture because of steepness of slope and rough topography.

The potential plant community on this soil is mainly rough fescue, bluebunch wheatgrass, Columbia needlegrass, and mountain brome. If the range is excessively grazed, the proportion of these plants decreases and the proportion of Idaho fescue, western wheatgrass, Letterman needlegrass, and spikeoat increases. If excessive grazing continues, plants such as timothy, Kentucky bluegrass, onespike danthonia, and perennial forbs may invade. The potential plant community produces about 3,200 pounds of air-dry vegetation in years of above-normal precipitation and 2,400 pounds in years of below-normal precipitation.

The surface layer is susceptible to water erosion and soil blowing if it is disturbed or if the range is overgrazed. Mechanical treatment is not practical, because the surface is flaggy and the slopes are steep.

This soil is poorly suited to windbreaks. It is limited mainly by slope.

The main limitations for homesite development on this soil are slope and the content of rock fragments. Slope is a concern in installing septic tank absorption fields. Absorption lines should be installed on the contour. Access roads should be designed to control surface runoff and help in stabilizing cut slopes. Removal of pebbles and cobbles in disturbed areas is needed for best results when landscaping, particularly in areas used for lawns.

This map unit is in capability subclass VIe, nonirrigated, and in Silty range site, 20- to 24-inch precipitation zone.

148—Libeg-Cheadle complex, 25 to 70 percent slopes. This map unit is on mountainsides and uplands in the central part of the county. Slopes commonly are more than 1,000 feet long. Elevation is 4,800 to 6,500 feet. The average annual precipitation is about 22 inches, the average annual air temperature is about 40 degrees F, and the average frost-free period is about 70 days.

This unit is about 45 percent Libeg flaggy loam and about 20 percent Cheadle very flaggy loam. The Libeg soil is on mountainsides, and the Cheadle soil is in convex areas and on ridge crests.

Included in this unit are small areas of Libeg very flaggy loam, deep Tigeron soils on wooded north-facing side slopes, and Rock outcrop on ridge crests. Included areas make up about 35 percent of the total acreage

The Libeg soil is deep and well drained. It formed in colluvium and alluvium derived dominantly from sandstone and igneous rock. Typically, the surface layer is dark brown flaggy loam about 5 inches thick. The next layer is brown very flaggy loam about 6 inches thick. The upper 6 inches of the subsoil is pale brown extremely flaggy clay loam, and the lower part to a depth of 60 inches or more is yellowish brown and light yellowish brown extremely flaggy clay loam.

Permeability of the Libeg soil is moderate. Available water capacity is low. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is 60 inches or more. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is slight.

The Cheadle soil is shallow and well drained. It formed in residuum derived dominantly from fractured hard sandstone. Typically, the surface layer is dark grayish brown very flaggy loam about 7 inches thick. The upper 8 inches of the underlying material is brown extremely channery loam, and the lower 4 inches is light yellowish brown extremely flaggy loam. Very pale brown sandstone is at a depth of 19 inches. Depth to sandstone ranges from 10 to 20 inches.

Permeability of the Cheadle soil is moderate. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. The average annual wetting depth where this soil is under native vegetation is 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

The soils in this unit are used as rangeland.

These soils are poorly suited to cultivated crops and to hay and pasture because of steepness of slope and rough topography.

The potential plant community on the Libeg soil is mainly rough fescue, bluebunch wheatgrass, Columbia needlegrass, and mountain brome. If the range is excessively grazed, the proportion of these plants decreases and the proportion of Idaho fescue, western wheatgrass, Letterman needlegrass, and spikeoat increases. If excessive grazing continues, plants such as timothy, Kentucky bluegrass, onespike danthonia, and perennial forbs may invade. The potential plant community produces about 3,200 pounds of air-dry vegetation in years of above-normal precipitation and 2,400 pounds in years of below-normal precipitation.

The potential plant community on the Cheadle soil is mainly bluebunch wheatgrass, rough fescue, Columbia needlegrass, and western wheatgrass. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of Idaho fescue, prairie junegrass, western wheatgrass, and timber oatgrass increases. If excessive grazing continues, plants such as broom snakeweed, onespike danthonia, perennial forbs, and annuals may invade. The potential plant community produces about 2,100 pounds of air-dry vegetation in years of above-normal precipitation and 1,300 pounds in years of below-normal precipitation.

The surface layer is susceptible to water erosion and soil blowing if it is disturbed or if the range is overgrazed. These soils are not suitable for mechanical treatment because of the steepness of slope and rough topography.

This soil is poorly suited to windbreaks. It is limited mainly by slope.

Slope, the high content of rock fragments, and the shallow depth to sandstone in the Cheadle soil make homesite development on these soils impractical.

This map unit is in capability subclass VIIe, nonirrigated. The Libeg soil is in Silty range site, 20- to 24-inch precipitation zone, and the Cheadle soil is in Shallow range site, 20- to 24-inch precipitation zone.

149—Linnet clay loam, 0 to 2 percent slopes. This deep, well drained soil is on terraces in the northern and eastern parts of the county. It formed in alluvium derived from mixed rock sources. Slopes commonly are 250 to 1,000 feet long. Elevation is 2,300 to 3,800 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 44 degrees F, and the average frost-free period is about 130 days.

Included in this unit are small areas of deep Verson soils that are underlain by very gravelly or extremely gravelly material at a depth of 20 to 40 inches.

Typically, the surface layer of this Linnet soil is grayish brown clay loam about 7 inches thick. The subsoil is grayish brown silty clay about 18 inches thick. The substratum to a depth of 60 inches or more is light gray and light brownish gray silty clay loam.

Permeability is slow. Available water capacity is high. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is about 22 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

This soil is used mainly for nonirrigated crops such as wheat, barley, and oats. It is also used for hay and pasture and as rangeland.

This soil is well suited to nonirrigated crops. It is limited mainly by low precipitation and the hazard of soil blowing. Because precipitation is not sufficient for annual cropping, a cropping system that includes small grain and summer fallow is most suitable. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, stubble-mulch tillage, and growing sod crops such as hay and pasture help to control soil blowing.

The potential plant community on this soil is mainly western wheatgrass, green needlegrass, bluebunch wheatgrass, and thickspike wheatgrass. If the range is excessively grazed, the proportion of these plants decreases and the proportion of plains reedgrass, blue grama, Sandberg bluegrass, and fringed sagewort increases. If excessive grazing continues, plants such as perennial weeds, broom snakeweed, annuals, and clubmoss may invade. The potential plant community produces about 1,400 pounds of air-dry vegetation in years of above-normal precipitation and 800 pounds in years of below-normal precipitation.

This soil is suitable for seeding to adapted grasses and forbs if the range is in poor condition. The surface layer is susceptible to soil blowing if it is disturbed or if the range is overgrazed.

This soil is well suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian crabapple, green ash, Siberian elm, white willow, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and cotoneaster. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings.

The main limitations for homesite development on this soil are slow permeability, shrink-swell potential, and low soil strength. If the soil is used for septic tank absorption fields, the slow permeability can be overcome by increasing the size of the absorption field. Shrinking and swelling and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential.

This map unit is in capability subclass IIIe, nonirrigated, and in Clayey range site, 10- to 14-inch precipitation zone.

150—Linnet clay loam, 2 to 8 percent slopes. This deep, well drained soil is on terraces and fans in the northern and eastern parts of the county. It formed in alluvium derived from mixed rock sources. Slopes commonly are 250 to 1,000 feet long. Elevation is 2,300 to 3,800 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 44 degrees F, and the average frost-free period is about 130 days.

Included in this unit are small areas of deep, salt- and alkali-affected Gerdrum soils in concave areas and deep Verson soils on plane side slopes. The Verson soils are underlain by very gravelly or extremely gravelly material at a depth of 20 to 40 inches.

Typically, the surface layer of this Linnet soil is grayish brown clay loam about 7 inches thick. The subsoil is grayish brown silty clay about 18 inches thick. The substratum to a depth of 60 inches or more is light gray and light brownish gray silty clay loam.

Permeability is slow. Available water capacity is high. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is about 22 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

This soil is used mainly for nonirrigated crops such as wheat, barley, and oats. It is also used for hay and pasture and as rangeland.

This soil is well suited to nonirrigated crops. It is limited mainly by low precipitation and the hazards of soil blowing and water erosion. Because precipitation is not sufficient for annual cropping, a cropping system that includes small grains and summer fallow is best. Minimum tillage, contour cultivation, stripcropping, tall grass barriers, grassed waterways, return of crop residue to the soil, and growing sod crops such as hay and pasture help to control soil blowing and water erosion. Tall grass barriers also reduce evaporation and trap snow, which increases the amount of moisture in the soil. Chiseling through stubble in fall on the contour or across the slope also helps to control water erosion.

The potential plant community on this soil is mainly western wheatgrass, green needlegrass, bluebunch wheatgrass, and thickspike wheatgrass. If the range is excessively grazed, the proportion of these plants decreases and the proportion of plains reedgrass, blue grama, Sandberg bluegrass, and fringed sagewort increases. If excessive grazing continues, plants such as perennial weeds, broom snakeweed, annuals, and clubmoss may invade. The potential plant community produces about 1,400 pounds of air-dry vegetation in years of above-normal precipitation and 800 pounds in years of below-normal precipitation.

Where clubmoss and blue grama are the dominant vegetation on this soil, pitting, furrowing, chiseling, or other mechanical treatment practices can be used to improve depleted rangeland. This soil is suitable for seeding to adapted grasses and forbs if the range is in poor condition. Seedbed preparation and planting on the contour or across the slope, where practical, conserve moisture and help to control water erosion. The surface layer is susceptible to water erosion and soil blowing if it is disturbed or if the range is overgrazed.

This soil is well suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian crabapple, green ash, Siberian elm, white willow, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and cotoneaster. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings. Planting on the contour helps to conserve moisture.

The main limitations for homesite development on this soil are slow permeability, shrink-swell potential, and low soil strength. If the soil is used for septic tank absorption fields, the slow permeability can be overcome by increasing the size of the absorption field. Shrinking and swelling and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential.

This map unit is in capability subclass IIIe, nonirrigated, and in Clayey range site, 10- to 14-inch precipitation zone.

151—Linwell silty clay loam, 0 to 2 percent slopes. This deep, well drained soil is on terraces in the central and western parts of the county. It formed in alluvium derived from mixed rock sources. Slopes commonly are more than 1,000 feet long. Elevation is 2,700 to 4,200 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 120 days.

Included in this unit are small areas of Korchea soils along drainageways on flood plains. Also included are small areas of Linwell soils that have an extremely gravelly substratum at a depth of 40 to 60 inches.

Typically, the surface layer of this Linwell soil is grayish brown silty clay loam about 6 inches thick. The subsoil is grayish brown and light brownish gray silty clay loam about 22 inches thick. The substratum to a depth of 66 inches or more is light brownish gray silty clay loam.

Permeability is slow. Available water capacity is high. Effective rooting depth is 66 inches or more. The average annual wetting depth where this soil is under native vegetation is about 26 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high.

This soil is used mainly for nonirrigated crops such as wheat, barley, and oats. It is also used for hay and pasture and as rangeland.

This soil is well suited to nonirrigated crops. It is limited mainly by the hazard of soil blowing and low precipitation. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, stubble-mulch tillage, and growing sod crops such as hay and pasture help to control soil blowing.

The potential plant community on this soil is mainly western wheatgrass, bluebunch wheatgrass, green needlegrass, and basin wildrye. If the range is excessively grazed, the proportion of these plants decreases and the proportion of Sandberg bluegrass, plains reedgrass, Idaho fescue, and blue grama increases. If excessive grazing continues, plants such as Kentucky bluegrass, broom snakeweed, perennial weeds, and annuals may invade. The potential plant community produces about 2,000 pounds of air-dry vegetation in years of above-normal precipitation and 1,500 pounds in years of below-normal precipitation.

This soil is suitable for seeding to adapted grasses and forbs if the range is in poor condition. The surface layer is susceptible to soil blowing if it is disturbed or if the range is overgrazed.

This soil is well suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian crabapple, green ash, Siberian elm, white willow, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and cotoneaster. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings.

The main limitations for homesite development on this soil are slow permeability, shrink-swell potential, potential frost action, and low soil strength. If the soil is used for septic tank absorption fields, the slow permeability can be overcome by increasing the size of the absorption field. Shrinking and swelling, frost action, and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential.

This map unit is in capability subclass IIIe, nonirrigated, and in Clayey range site, 15- to 19-inch precipitation zone.

152—Linwell silty clay loam, 2 to 8 percent slopes. This deep, well drained soil is on fans in the central and western parts of the county. It formed in alluvium derived from mixed rock sources. Slopes commonly are 250 to 1,000 feet long. Elevation is 2,700 to 4,200 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 120 days.

Included in this unit are small convex areas of moderately deep Winifred soils and small, concave areas of deep Gerber soils.

Typically, the surface layer of this Linwell soil is grayish brown silty clay loam about 6 inches thick. The subsoil is grayish brown and light brownish gray silty clay loam about 22 inches thick. The substratum to a depth of 66 inches or more is light brownish gray silty clay loam.

Permeability is slow. Available water capacity is high. Effective rooting depth is 66 inches or more. The average annual wetting depth where this soil is under native vegetation is about 26 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high.

This soil is used mainly for nonirrigated crops such as wheat, barley, and oats. It is also used for hay and pasture and as rangeland.

This soil is well suited to nonirrigated crops. It is limited mainly by the hazards of soil blowing and water erosion and by low precipitation. Minimum tillage, contour cultivation, grassed waterways, stripcropping, and growing sod crops such as hay and pasture help to control soil blowing and water erosion.

The potential plant community on this soil is mainly western wheatgrass, bluebunch wheatgrass, green needlegrass, and basin wildrye. If the range is excessively grazed, the proportion of these plants decreases and the proportion of Sandberg bluegrass, plains reedgrass, Idaho fescue, and blue grama increases. If excessive grazing continues, plants such as Kentucky bluegrass, broom snakeweed, perennial weeds, and annuals may invade. The potential plant community produces about 2,000 pounds of air-dry vegetation in years of above-normal precipitation and 1,500 pounds in years of below-normal precipitation.

This soil is suitable for seeding to adapted grasses and forbs if the range is in poor condition. Seedbed preparation and planting on the contour or across the slope, where practical, conserve moisture and help to control water erosion. The surface layer is susceptible to water erosion and soil blowing if it is disturbed or the range is overgrazed.

This soil is well suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian crabapple, green ash, Siberian elm, white willow, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and cotoneaster. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings. Planting on the contour helps to conserve moisture.

The main limitations for homesite development on this soil are slow permeability, shrink-swell potential, potential frost action, and low soil strength. If the soil is used for septic tank absorption fields, the slow permeability can be overcome by increasing the size of the absorption field. Shrinking and swelling, frost action, and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential.

This map unit is in capability subclass IIIe, nonirrigated, and in Clayey range site, 15- to 19-inch precipitation zone.

153—Linwell-Winifred clay loams, 4 to 8 percent slopes. This map unit is on uplands in the central and western parts of the county. Slopes commonly are 250 to 1,000 feet long. Elevation is 2,700 to 4,200 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 120 days.

This unit is about 50 percent Linwell clay loam and 35 percent Winifred clay loam. The Linwell soil is on fans and foot slopes, and the Winifred soil is on uplands.

Included in this unit are small areas of deep Gerber soils. Included areas make up about 15 percent of the total acreage.

The Linwell soil is deep and well drained. It formed in alluvium derived from mixed rock sources. Typically, the surface layer is grayish brown clay loam about 6 inches thick. The subsoil is grayish brown and light brownish gray silty clay loam about 22 inches thick. The substratum to a depth of 66 inches or more is light brownish gray silty clay loam.

Permeability of the Linwell soil is slow. Available water capacity is high. Effective rooting depth is 66 inches or more. The average annual wetting depth where this soil is under native vegetation is about 26 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high.

The Winifred soil is moderately deep and well drained. It formed in alluvium and residuum derived dominantly from semiconsolidated shale. Typically, the surface layer is dark grayish brown clay loam about 6 inches thick. The subsoil is grayish brown silty clay and clay about 26 inches thick. Light brownish gray and yellowish brown shale is at a depth of about 32 inches. Depth to shale ranges from 20 to 40 inches.

Permeability of the Winifred soil is slow. Available water capacity is low to moderate. Effective rooting depth is 20 to 40 inches. The average annual wetting depth where this soil is under native vegetation is 20 to 26 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

The soils in this unit are used for nonirrigated crops, mainly wheat, barley, oats, alfalfa, and grass for hay and pasture. They are also used as rangeland.

These soils are well suited to nonirrigated crops. They are limited mainly by the hazards of soil blowing and water erosion and by low precipitation. Minimum tillage,

contour cultivation, grassed waterways, stripcropping, and growing sod crops such as hay and pasture help to control soil blowing and water erosion.

The potential plant community on these soils is mainly bluebunch wheatgrass, green needlegrass, western wheatgrass, and Idaho fescue. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of Idaho fescue, plains reedgrass, Sandberg bluegrass, and blue grama increases. If excessive grazing continues, plants such as broom snakeweed, Kentucky bluegrass, perennial weeds, and annuals may invade. The potential plant community produces about 2,100 pounds of air-dry vegetation in years of above-normal precipitation and 1,600 pounds in years of below-normal precipitation.

These soils are suitable for seeding to adapted grasses and forbs if the range is in poor condition. Seedbed preparation and planting on the contour or across the slope, where practical, conserve moisture and help to control water erosion. The surface layer is susceptible to water erosion and soil blowing if it is disturbed or if the range is overgrazed.

The Linwell soil is well suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian crabapple, green ash, Siberian elm, white willow, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and cotoneaster.

The Winifred soil is suited to windbreaks, but the low to moderate available water capacity limits the growth of both trees and shrubs. Suitable trees for planting are Russian-olive, Siberian crabapple, green ash, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and cotoneaster.

Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings on these soils. Planting on the contour helps to conserve moisture.

The main limitations for homesite development on the soils in this unit are slow permeability, shrink-swell potential, low soil strength, and moderate depth to shale in the Winifred soil. The soils are severely limited for septic tank absorption fields because of the slow permeability and the moderate depth to shale in the Winifred soil. Shrinking and swelling and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential.

This map unit is in capability subclass IIIe, nonirrigated, and in Clayey range site, 15- to 19-inch precipitation zone.

154—Little Horn silt loam, 2 to 8 percent slopes. This moderately deep, well drained soil is on uplands in the southern part of the county. It formed in residuum derived dominantly from fractured hard limestone. Slopes commonly are 250 to 1,000 feet long. Elevation is 4,700 to 6,500 feet. The average annual precipitation is about 22 inches, the average annual air temperature is about 40 degrees F, and the average frost-free period is about 70 days.

Included in this unit are small areas of moderately deep Skaggs soils in convex areas. Also included are small areas of Little Horn stony loam.

Typically, the surface layer of this Little Horn soil is very dark grayish brown silt loam about 8 inches thick. The upper 7 inches of the subsoil is dark grayish brown silty clay loam, and the lower 7 inches is brown silty clay. The substratum is pale brown clay loam about 7 inches thick. Limestone is at a depth of about 29 inches. Depth to limestone ranges from 20 to 40 inches.

Permeability is slow. Available water capacity is low to moderate. Effective rooting depth is 20 to 40 inches. The average annual wetting depth where this soil is under native vegetation is 20 to 40 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

This soil is used mainly as rangeland. It is also used for hay and pasture and for nonirrigated crops such as wheat, barley, and oats.

This soil is suited to nonirrigated crops. It is limited mainly by the hazards of water erosion and soil blowing and by the short growing season. Timeliness is of prime importance in all tillage, seeding, and harvesting operations. Minimum tillage, contour cultivation, grassed waterways, stubble-mulch tillage, and growing sod crops such as hay and pasture help to control soil blowing and water erosion.

The potential plant community on this soil is mainly rough fescue, bluebunch wheatgrass, Columbia needlegrass, and mountain brome. If the range is excessively grazed, the proportion of these plants decreases and the proportion of Idaho fescue, western wheatgrass, Letterman needlegrass, and spikeoat increases. If excessive grazing continues, plants such as timothy, Kentucky bluegrass, onespike danthonia, and perennial forbs may invade. The potential plant community produces about 3,500 pounds of air-dry vegetation in years of above-normal precipitation and 2,600 pounds in years of below-normal precipitation.

This soil is suitable for seeding to adapted grasses and forbs if the range is in poor condition. Seedbed preparation and planting on the contour or across the slope, where practical, conserve moisture and help to control water erosion. The surface layer is susceptible to water erosion and soil blowing if it is disturbed or if the range is overgrazed.

This soil is suited to windbreaks, but the low to moderate available water capacity limits the growth of

both trees and shrubs. Suitable trees for planting are Russian-olive, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, western sandcherry, and skunkbush sumac. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings.

The main limitations for homesite development on this soil are slow permeability, moderate depth to limestone, shrink-swell potential, potential frost action, and low soil strength. The soil is severely limited for septic tank absorption fields because of the slow permeability and moderate depth to limestone. Cuts to level building sites can expose limestone. Shrinking and swelling, frost action, and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential.

This map unit is in capability subclass IVe, nonirrigated, and in Silty range site, 20- to 24-inch precipitation zone.

155—Little Horn silt loam, 8 to 15 percent slopes. This moderately deep, well drained soil is on uplands in the southern part of the county. It formed in residuum derived dominantly from fractured hard limestone. Slopes commonly are 250 to 1,000 feet long. Elevation is 4,700 to 6,500 feet. The average annual precipitation is about 22 inches, the average annual air temperature is about 40 degrees F, and the average frost-free period is about 70 days.

Included in this unit are small areas of moderately deep Skaggs soils in convex areas and deep Burnette soils in swales.

Typically, the surface layer of this Little Horn soil is very dark grayish brown silt loam about 8 inches thick. The upper 7 inches of the subsoil is dark grayish brown silty clay loam, and the lower 7 inches is brown silty clay. The substratum is pale brown clay loam about 7 inches thick. Limestone is at a depth of about 29 inches. Depth to limestone ranges from 20 to 40 inches.

Permeability is slow. Available water capacity is low to moderate. Effective rooting depth is 20 to 40 inches. The average annual wetting depth where this soil is under native vegetation is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

This soil is used mainly as rangeland. It is also used for hay and pasture and for nonirrigated crops such as wheat, barley, and oats.

This soil is suited to nonirrigated crops. It is limited mainly by the hazards of water erosion and soil blowing and by the short growing season. Timeliness is of prime importance in all tillage, seeding, and harvesting operations. Minimum tillage, contour cultivation, grassed waterways, stubble-mulch tillage, and growing sod crops such as hay and pasture help to control soil blowing and water erosion.

The potential plant community on this soil is mainly rough fescue, bluebunch wheatgrass, Columbia needlegrass, and mountain brome. If the range is excessively grazed, the proportion of these plants decreases and the proportion of Idaho fescue, western wheatgrass, Letterman needlegrass, and spikeoat increases. If excessive grazing continues, plants such as timothy, Kentucky bluegrass, onespike danthonia, and perennial forbs may invade. The potential plant community produces about 3,500 pounds of air-dry vegetation in years of above-normal precipitation and 2,600 pounds in years of below-normal precipitation.

This soil is suitable for seeding to adapted grasses and forbs if the range is in poor condition. Seedbed preparation and planting on the contour or across the slope, where practical, conserve moisture and help to control water erosion. The surface layer is susceptible to water erosion and soil blowing if it is disturbed or if the range is overgrazed.

This soil is suited to windbreaks, but the low to moderate available water capacity limits the growth of both trees and shrubs. Suitable trees for planting are Russian-olive, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, western sandcherry, and skunkbush sumac. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings. Planting on the contour helps to conserve moisture.

The main limitations for homesite development on this soil are slow permeability, moderate depth to limestone, shrink-swell potential, potential frost action, and low soil strength. The soil is severely limited for septic tank absorption fields because of the slow permeability and moderate depth to limestone. Cuts to level building sites can expose limestone. Shrinking and swelling, frost action, and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential.

This map unit is in capability subclass IVe, nonirrigated, and in Silty range site, 20- to 24-inch precipitation zone.

156—Little Horn-Skaggs stony loams, 4 to 15 percent slopes. This map unit is on uplands in the southern part of the county. Slopes commonly are 250 to 1,000 feet long. Elevation is 4,700 to 6,500 feet. The average annual precipitation is about 22 inches, the

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

This unit is about 45 percent Little Horn stony loam and 45 percent Skaggs stony loam.

Included in this unit are small areas of shallow Sheege soils on ridges and Little Horn loam on plane slopes. Included areas make up about 10 percent of the total acreage.

The Little Horn soil is moderately deep and well drained. It formed in residuum derived dominantly from fractured hard limestone. Typically, the surface layer is very dark grayish brown stony loam about 8 inches thick. The upper 7 inches of the subsoil is dark grayish brown silty clay loam, and the lower 7 inches is brown silty clay. The substratum is pale brown clay loam about 7 inches thick. Limestone is at a depth of about 29 inches. Depth to limestone ranges from 20 to 40 inches.

Permeability of the Little Horn soil is slow. Available water capacity is low to moderate. Effective rooting depth is 20 to 40 inches. The average annual wetting depth where this soil is under native vegetation is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is slight.

The Skaggs soil is moderately deep and well drained. It formed in residuum derived dominantly from fractured hard limestone. Typically, the surface layer is very dark grayish brown stony loam about 8 inches thick. The upper 16 inches of the underlying material is light gray and white very gravelly loam, and the lower 8 inches is pale yellow very gravelly clay loam. Limestone is at a depth of about 32 inches. Depth to limestone ranges from 20 to 40 inches.

Permeability of the Skaggs soil is moderate. Available water capacity is low. Effective rooting depth is 20 to 40 inches. The average annual wetting depth where this soil is under native vegetation is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is slight.

The soils in this unit are used as rangeland.

These soils are poorly suited to cultivated crops and to hay and pasture because large stones are in the surface layer.

The potential plant community on these soils is mainly rough fescue, bluebunch wheatgrass, Columbia needlegrass, and mountain brome. If the range is excessively grazed, the proportion of these plants decreases and the proportion of Idaho fescue, western wheatgrass, Letterman needlegrass, and spikeoat increases. If excessive grazing continues, plants such as timothy, Kentucky bluegrass, onespike danthonia, and perennial forbs may invade. The potential plant community produces about 3,500 pounds of air-dry vegetation in years of above-normal precipitation and 2,600 pounds in years of below-normal precipitation.

The surface layer is susceptible to water erosion if it is disturbed or the range is overgrazed. The soils are not suitable for mechanical treatment because of the large stones in the surface layer.

These soils are poorly suited to windbreaks. They are limited by stoniness.

The main limitations for homesite development on the soils in this unit are slow and moderate permeability, moderate depth to limestone, shrink-swell potential, potential frost action, content of rock fragments, and low soil strength. The soils are severely limited for septic tank absorption fields because of the slow and moderate permeability and moderate depth to limestone. Cuts to level building sites can expose limestone. Shrinking and swelling, frost action, and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential. Removal of pebbles and cobbles in disturbed areas is needed for best results when landscaping, particularly in areas used for lawns.

This map unit is in capability subclass VIs, nonirrigated, and in Silty range site, 20- to 24-inch precipitation zone.

157—Loken-Brazon silty clay loams, 2 to 8 percent slopes. This map unit is on uplands in the central and southern parts of the county. Slopes commonly are 250 to 1,000 feet long. Elevation is 4,000 to 5,000 feet. The average annual precipitation is about 20 inches, the average annual air temperature is about 42 degrees F, and the average frost-free period is about 100 days.

This unit is about 60 percent Loken silty clay loam and 30 percent Brazon silty clay loam. The Loken soil is on fans, and the Brazon soil is on uplands.

Included in this unit is about 10 percent Brazon very stony clay loam.

The Loken soil is deep and well drained. It formed in alluvium and residuum derived dominantly from limestone and calcareous shale. Typically, the surface layer is very dark gray silty clay loam about 6 inches thick. The upper 5 inches of the subsoil is brown silty clay loam, and the lower 4 inches is grayish brown clay loam. The substratum to a depth of 60 inches or more is light gray gravelly clay loam.

Permeability of the Loken soil is slow. Available water capacity is moderate to high. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is slight.

The Brazon soil is deep and well drained. It formed in clayey alluvium and colluvium derived dominantly from semiconsolidated shale. Typically, the surface layer is very dark gray silty clay loam about 8 inches thick. The upper 9 inches of the subsoil is light brownish gray very

stony clay loam, and the lower 8 inches is light brownish gray very cobbly clay. The upper 15 inches of the substratum is light brownish gray very cobbly clay, and the lower 6 inches is light yellowish brown clay. Brownish yellow shale is at a depth of about 46 inches. Depth to shale ranges from 40 to 60 inches.

Permeability of the Brazon soil is slow. Available water capacity is moderate. Effective rooting depth is 40 to 60 inches. The average annual wetting depth where this soil is under native vegetation is 40 to 60 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high.

The soils in this unit are used mainly for hay and pasture. They are also used as rangeland and for nonirrigated crops such as wheat, barley, and oats.

These soils are suited to nonirrigated crops. They are limited mainly by the hazard of soil blowing on the Brazon soil, the hazard of water erosion, and the short growing season. Minimum tillage, contour cultivation, grassed waterways, stubble-mulch tillage, and growing sod crops such as hay and pasture help to control soil blowing and water erosion.

The potential plant community on these soils is mainly rough fescue, bluebunch wheatgrass, green needlegrass, and western wheatgrass. If the range is excessively grazed, the proportion of these plants decreases and the proportion of Idaho fescue, plains reedgrass, blue grama, and Sandberg bluegrass increases. If excessive grazing continues, plants such as timothy, clubmoss, perennial weeds, and annuals may invade. The potential plant community produces about 2,300 pounds of air-dry vegetation in years of above-normal precipitation and 1,700 pounds in years of below-normal precipitation.

These soils are suitable for seeding to adapted grasses and forbs if the range is in poor condition. Seedbed preparation and planting on the contour or across the slope, where practical, conserve moisture and help to control water erosion. The surface layer is susceptible to water erosion and soil blowing if it is disturbed or if the range is overgrazed.

The Loken soil is well suited to windbreaks, but the moderate available water capacity limits the growth of both trees and shrubs. Suitable trees for planting are Russian-olive, Siberian crabapple, green ash, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and cotoneaster.

The Brazon soil is suited to windbreaks, but the high concentration of lime below a depth of 15 inches and the limited moisture supply restrict the choice of trees and shrubs. Suitable trees for planting are Russian-olive, Siberian elm, white willow, golden willow, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, skunkbush sumac, and silver buffaloberry.

Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings on these soils. Planting on the contour helps to conserve moisture.

The main limitations for homesite development on the soils in this unit are slow permeability, shrink-swell potential, potential frost action, content of rock fragments, and low soil strength. The soils are severely limited for septic tank absorption fields because of the slow permeability and the 40- to 60-inch depth to shale in the Brazon soil. Shrinking and swelling, frost action, and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential.

This map unit is in capability subclass IIIe, nonirrigated, and in Clayey range site, 15- to 19-inch precipitation zone.

158—Lolo very gravelly loam, 0 to 4 percent slopes. This deep, somewhat excessively drained soil is on fans and terraces in the central part of the county. It formed in alluvium derived dominantly from igneous rock. Slopes commonly are 250 to 1,000 feet long. Elevation is 3,800 to 4,700 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 120 days.

Included in this unit are small areas of deep Farnuf, Tamaneen, Nesda, and Roy soils.

Typically, the surface layer of this Lolo soil is dark grayish brown very gravelly loam about 5 inches thick. The upper 7 inches of the subsoil is brown very gravelly loam, and the lower part to a depth of 60 inches or more is brown extremely gravelly loam.

Permeability is moderately rapid. Available water capacity is low to moderate. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is about 30 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

This soil is used as rangeland.

This soil is poorly suited to cultivated crops and to hay and pasture because of the gravel in the surface layer and droughtiness.

The potential plant community on this soil is mainly bluebunch wheatgrass, green needlegrass, rough fescue, and western wheatgrass. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of Idaho fescue, needleandthread, western wheatgrass, and blue grama increases. If excessive grazing continues, weedy plants such as timothy, Kentucky bluegrass, clubmoss, and perennial weeds may invade. The potential plant community

produces about 2,200 pounds of air-dry vegetation in years of above-normal precipitation and 1,400 pounds in years of below-normal precipitation.

The surface layer is susceptible to soil blowing if it is disturbed or if the range is overgrazed. The soil is poorly suited to mechanical treatment because of the very gravelly surface layer.

This soil is poorly suited to windbreaks. It is limited by the high content of gravel and the low to moderate available water capacity.

This soil is well suited to homesite development. It is limited mainly by the content of gravel. Removal of pebbles in disturbed areas is needed for best results when landscaping, particularly in areas used for lawns. The very gravelly or extremely gravelly material below a depth of about 5 inches is good road fill.

This map unit is in capability subclass VIs, nonirrigated, and in Silty range site, 15- to 19-inch precipitation zone.

159—Marcott silty clay loam. This deep, somewhat poorly drained soil is on low terraces and flood plains. It formed in alluvium. Slope ranges from 0 to 2 percent. Slopes commonly are more than 1,000 feet long. Elevation is 3,300 to 4,600 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 120 days.

Included in this unit are small areas of Marcott silty clay in swales. Also included are small areas of soils that have an extremely gravelly substratum at a depth of 20 to 40 inches.

Typically, the surface layer of this Marcott soil is gray silty clay loam about 8 inches thick. The upper 11 inches of the subsoil is light brownish gray and light gray silty clay, and the lower 6 inches is light gray silty clay. The upper 17 inches of the substratum is light gray silty clay and clay, and the lower part to a depth of 66 inches or more is light gray extremely gravelly sandy clay loam.

Permeability is slow to a depth of about 42 inches and moderate or moderately rapid below this depth. Available water capacity is high. Effective rooting depth is 66 inches or more. The average annual wetting depth where this soil is under native vegetation is 66 inches or more. A seasonal high water table is at a depth of 24 to 36 inches in spring and early in summer. Runoff is slow, and the hazard of water erosion is slight except during rare periods of flooding. The hazard of soil blowing is high.

This soil is used mainly for hay and pasture. It is also used as rangeland. If adequately drained, this soil can be used for nonirrigated crops.

This soil is suited to hay and pasture. It is limited mainly by the high water table and the hazards of flooding and soil blowing. Wetness limits the choice of plants and the period of cutting or grazing. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and to protect the soil from erosion.

The potential plant community on this soil is mainly tall sedges, American mannagrass, slender wheatgrass, and prairie cordgrass. If the range is excessively grazed, the proportion of these plants decreases and the proportion of mat muhly, sedges, Baltic rush, and western wheatgrass increases. If excessive grazing continues, plants such as Kentucky bluegrass, timothy, and annuals may invade. The potential plant community produces about 4,500 pounds of air-dry vegetation in years of above-normal precipitation and 3,000 pounds in years of below-normal precipitation.

Grazing should be delayed until the soil has sufficiently dried and is firm enough to withstand trampling by livestock. This soil is suitable for seeding to adapted grasses and forbs if the range is in poor condition.

This soil is suited to windbreaks, but the seasonal high water table at a depth of 24 to 36 inches during most of the growing season limits the choice of trees and shrubs to those that are water tolerant. Suitable trees for planting are Russian-olive, green ash, Siberian elm, white willow, golden willow, and plains cottonwood. Suitable shrubs are Tatarian honeysuckle, common chokecherry, lilac, purpleosier willow, silver buffaloberry, and redosier dogwood.

The seasonal high water table and the hazard of rare flooding make homesite development on this soil impractical.

This map unit is in capability subclass VIw, nonirrigated, and in Subirrigated range site, 15- to 19-inch precipitation zone.

160—Marias silty clay, 0 to 2 percent slopes. This deep, well drained soil is on fans and terraces in the northeastern part of the county. It formed in alluvium derived dominantly from shale. Slopes commonly are more than 1,000 feet long. Elevation is 2,400 to 3,600 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 44 degrees F, and the average frost-free period is about 130 days.

Included in this unit are small areas of deep, salt- and alkali-affected Marvan soils. Also included are small areas of Marias soils that have slopes of 2 to 4 percent.

Typically, the surface layer of this Marias soil is olive gray silty clay about 6 inches thick. The underlying material to a depth of 60 inches or more is olive gray silty clay.

Permeability is very slow. Available water capacity is high. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is about 24 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high.

This soil is used for nonirrigated crops, mainly wheat, barley, oats, alfalfa, and grass for hay and pasture. It is also used as rangeland.

This soil is well suited to nonirrigated crops. It is limited mainly by the hazard of soil blowing and low precipitation. Because precipitation is not sufficient for annual cropping, a cropping system that includes small grains and summer fallow is best. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, stubble-mulch tillage, and growing sod crops such as hay and pasture help to control soil blowing.

The potential plant community on this soil is mainly western wheatgrass, green needlegrass, bluebunch wheatgrass, and thickspike wheatgrass. If the range is excessively grazed, the proportion of these plants decreases and the proportion of plains reedgrass, Sandberg bluegrass, prairie junegrass, and big sagebrush increases. If excessive grazing continues, plants such as perennial weeds, broom snakeweed, curlycup gumweed, and annual bromes may invade. The potential plant community produces about 1,400 pounds of air-dry vegetation in years of above-normal precipitation and 800 pounds in years of below-normal precipitation.

This soil is suitable for seeding to adapted grasses and forbs if the range is in poor condition. The surface layer is susceptible to soil blowing if it is disturbed or the range is overgrazed.

This soil is well suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian crabapple, green ash, Siberian elm, white willow, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and cotoneaster. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings.

The main limitations for homesite development on this soil are very slow permeability, shrink-swell potential, and low soil strength. If the soil is used for septic tank absorption fields, the very slow permeability can be overcome by increasing the size of the absorption field. Shrinking and swelling and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential.

This map unit is in capability subclass IIIe, nonirrigated, and in Clayey range site, 10- to 14-inch precipitation zone.

161—Marias silty clay, 2 to 8 percent slopes. This deep, well drained soil is on fans and terraces in the northeastern part of the county. It formed in alluvium derived dominantly from shale. Slopes commonly are 250 to 1,000 feet long. Elevation is 2,400 to 3,600 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 44 degrees F, and the average frost-free period is about 130 days.

Included in this unit are small areas of deep, salt- and alkali-affected Marvan soils along drainageways and deep Kobar soils on the upper parts of fans.

Typically, the surface layer of this Marias soil is olive gray silty clay about 6 inches thick. The underlying material to a depth of 60 inches or more is olive gray silty clay.

Permeability is very slow. Available water capacity is high. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is about 24 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high.

This soil is used for nonirrigated crops, mainly wheat, barley, oats, alfalfa, and grass for hay and pasture. It is also used as rangeland.

This soil is suited to nonirrigated crops. It is limited mainly by the hazards of soil blowing and water erosion and by low precipitation. Because precipitation is not sufficient for annual cropping, a cropping system that includes small grains and summer fallow is best. Minimum tillage, contour cultivation, grassed waterways, stripcropping, and growing sod crops such as hay and pasture help to control soil blowing and water erosion. Crop residue left on or near the surface helps to conserve moisture, increases the water intake rate, and improves tilth.

The potential plant community on this soil is mainly western wheatgrass, green needlegrass, bluebunch wheatgrass, and thickspike wheatgrass. If the range is excessively grazed, the proportion of these plants decreases and the proportion of plains reedgrass, Sandberg bluegrass, prairie junegrass, and big sagebrush increases. If excessive grazing continues, plants such as perennial weeds, broom snakeweed, curlycup gumweed, and annual bromes may invade. The potential plant community produces about 1,400 pounds of air-dry vegetation in years of above-normal precipitation and 800 pounds in years of below-normal precipitation.

This soil is suitable for seeding to adapted grasses and forbs if the range is in poor condition. Seedbed preparation and planting on the contour or across the slope, where practical, conserve moisture and help to control water erosion. The surface layer is susceptible to water erosion and soil blowing if it is disturbed or if the range is overgrazed.

This soil is well suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian crabapple, green ash, Siberian elm, white willow, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and cotoneaster.

Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings. Planting on the contour helps to conserve moisture.

The main limitations for homesite development on this soil are very slow permeability, shrink-swell potential, and low soil strength. If the soil is used for septic tank absorption fields, the very slow permeability can be overcome by increasing the size of the absorption field. Shrinking and swelling and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential.

This map unit is in capability subclass IIIe, nonirrigated, and in Clayey range site, 10- to 14-inch precipitation zone.

162—Marmarth loam, 2 to 8 percent slopes. This moderately deep, well drained soil is on uplands in the northern part of the county. It formed in residuum derived dominantly from weakly consolidated sandy and silty sedimentary beds. Slopes commonly are 250 to 1,000 feet long. Elevation is 2,900 to 3,500 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 44 degrees F, and the average frost-free period is about 130 days.

Included in this unit are small areas of deep Evanston soils on fans and foot slopes and moderately deep Tanna soils in plane areas on uplands.

Typically, the surface layer of this Marmarth soil is grayish brown loam about 6 inches thick. The upper 9 inches of the subsoil is brown silty clay loam, and the lower 6 inches is light brownish gray silt loam. The substratum is light brownish gray silt loam about 13 inches thick. Light brownish gray sedimentary beds are at a depth of about 34 inches. Depth to sedimentary beds ranges from 20 to 40 inches.

Permeability is moderate. Available water capacity is low to moderate. Effective rooting depth is 20 to 40 inches. The average annual wetting depth where this soil is under native vegetation is 20 to 24 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

This soil is used for nonirrigated crops, mainly wheat, barley, oats, alfalfa, and grass for hay and pasture. It is also used as rangeland.

This soil is well suited to nonirrigated crops. It is limited mainly by low precipitation and the hazards of water erosion and soil blowing. Because precipitation is not sufficient for annual cropping, a cropping system that includes small grains and summer fallow is best. Minimum tillage, contour cultivation, grassed waterways, stripcropping, and growing sod crops such as hay and pasture help to control soil blowing and water erosion.

The potential plant community on this soil is mainly bluebunch wheatgrass, western wheatgrass, green needlegrass, and needleandthread. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of needleandthread, blue grama, prairie junegrass, and fringed sagewort increases. If excessive grazing continues, plants such as pricklypear, perennial weeds, annuals, and clubmoss may invade. The potential plant community produces about 1,600 pounds of air-dry vegetation in years of above-normal precipitation and 1,000 pounds in years of below-normal precipitation.

Where clubmoss and blue grama are the dominant vegetation on this soil, pitting, furrowing, chiseling, or other mechanical treatment practices can be used to improve depleted rangeland. This soil is suitable for seeding to adapted grasses and forbs if the range is in poor condition. Seedbed preparation and planting on the contour or across the slope, where practical, conserve moisture and help to control water erosion. The surface layer is susceptible to water erosion and soil blowing if it is disturbed or if the range is overgrazed.

This soil is suited to windbreaks, but the low to moderate available water capacity limits the growth of both trees and shrubs. Suitable trees for planting are Russian-olive, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, western sandcherry, and skunkbush sumac. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings.

The main limitations for homesite development on this soil are moderate depth to sedimentary beds, shrink-swell potential, potential frost action, and low soil strength. If the soil is used for septic tank absorption fields, the slow permeability of the underlying sedimentary beds can be overcome by increasing the size of the absorption field or by excavating the trench to a suitable depth. The field or trench should be backfilled with gravel. Shrinking and swelling, frost action, and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential.

This map unit is in capability subclass IIIe, nonirrigated, and in Silty range site, 10- to 14-inch precipitation zone.

163—Marmarth-Cabbart loams, 4 to 8 percent slopes. This map unit is on uplands in the northeastern part of the county. Slopes commonly are 250 to 1,000 feet long. Elevation is 2,900 to 3,500 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 44 degrees F, and the average frost-free period is about 130 days.

This unit is about 60 percent Marmarth loam and 30 percent Cabbart loam. The Marmarth soil is on plane side slopes, and the Cabbart soil is on ridges and knolls.

Included in this unit are small areas of moderately deep Abor soils and shallow Rentsac soils. Also included are small areas of moderately deep sandy loams in convex areas. Included areas make up about 10 percent of the total acreage.

The Marmarth soil is moderately deep and well drained. It formed in residuum derived dominantly from weakly consolidated, sandy and silty sedimentary beds. Typically, the surface layer is grayish brown loam about 6 inches thick. The upper 9 inches of the subsoil is brown silty clay loam, and the lower 6 inches is light brownish gray silt loam. The substratum is light brownish gray silt loam about 13 inches thick. Light brownish gray sedimentary beds are at a depth of about 34 inches. Depth to sedimentary beds ranges from 20 to 40 inches.

Permeability of the Marmarth soil is moderate. Available water capacity is low to moderate. Effective rooting depth is 20 to 40 inches. The average annual wetting depth where this soil is under native vegetation is 20 to 24 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

The Cabbart soil is shallow and well drained. It formed in residuum derived dominantly from weakly consolidated, sandy and silty sedimentary beds. Typically, the surface layer is grayish brown loam about 6 inches thick. The upper 7 inches of the underlying material is light gray loam, and the lower 5 inches is light gray very fine sandy loam. Light gray sedimentary beds are at a depth of about 18 inches. Depth to sedimentary beds ranges from 10 to 20 inches.

Permeability of the Cabbart soil is moderate. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. The average annual wetting depth where this soil is under native vegetation is 10 to 20 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high.

The soils in this unit are used for nonirrigated crops, mainly wheat, barley, oats, alfalfa, and grass for hay and pasture. They are also used as rangeland.

These soils are suited to nonirrigated crops. They are limited mainly by low precipitation, moderate to very low available water capacity, and the hazards of soil blowing and water erosion. Because precipitation is not sufficient for annual cropping, a cropping system that includes small grains and summer fallow is best. Minimum tillage, contour cultivation, grassed waterways, stripcropping, and growing sod crops such as hay and pasture help to control soil blowing and water erosion. Tall grass barriers trap snow, which increases the amount of moisture in the soil.

The potential plant community on the Marmarth soil is mainly bluebunch wheatgrass, western wheatgrass, green needlegrass, and needleandthread. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of needleandthread, blue grama, prairie junegrass, and fringed sagewort increases. If excessive grazing continues, plants such as pricklypear, perennial weeds, annuals, and clubmoss may invade. The potential plant community produces about 1,600 pounds of air-dry vegetation in years of above-normal precipitation and 1,000 pounds in years of below-normal precipitation.

The potential plant community on the Cabbart soil is mainly bluebunch wheatgrass, western wheatgrass, plains muhly, and green needlegrass. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, blue grama, prairie junegrass, and threadleaf sedge increases. If excessive grazing continues, plants such as red threeawn, annuals, and perennial weeds may invade. The potential plant community produces about 900 pounds of air-dry vegetation in years of above-normal precipitation and 500 pounds in years of below-normal precipitation.

These soils are suitable for seeding to adapted grasses and forbs if the range is in poor condition. Seedbed preparation and planting on the contour or across the slope, where practical, conserve moisture and help to control water erosion. The surface layer is susceptible to water erosion and soil blowing if it is disturbed or if the range is overgrazed.

The Marmarth soil is suited to windbreaks, but the low to moderate available water capacity limits the growth of both trees and shrubs. Suitable trees for planting are Russian-olive, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, western sandcherry, and skunkbush sumac. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings. Planting on the contour helps to conserve moisture.

The Cabbart soil is poorly suited to windbreaks. It is limited mainly by the very low available water capacity.

The main limitations for homesite development on the soils in this unit are moderate and shallow depth to sedimentary beds, shrink-swell potential, potential frost action, and low soil strength. If the soils are used for septic tank absorption fields, the slow permeability of the underlying sedimentary beds can be overcome by increasing the size of the absorption field or by excavating the trench to a suitable depth. The field or trench should be backfilled with gravel. Shrinking and swelling, frost action, and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential.

This map unit is in capability subclass IVe, nonirrigated. The Marmarth soil is in Silty range site, 10- to 14-inch precipitation zone, and the Cabbart soil is in Shallow range site, 10- to 14-inch precipitation zone.

164—Martinsdale loam, 0 to 4 percent slopes. This deep, well drained soil is on terraces in the western part of the county. It formed in alluvium derived dominantly from limestone. Slopes commonly are more than 1,000 feet long. Elevation is 3,500 to 3,800 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 120 days.

Included in this unit are small areas of deep Fairfield soils on concave side slopes and deep Judell and Judith soils in convex areas. The Judith soil is underlain by very gravelly or extremely gravelly material at a depth of 24 to 40 inches. Also included are small areas of soils that are similar to this Martinsdale soil but do not have rock fragments within a depth of 60 inches.

Typically, the surface layer of this Martinsdale soil is grayish brown loam about 6 inches thick. The subsoil is brown and grayish brown clay loam about 18 inches thick. The upper 19 inches of the substratum is light gray sandy clay loam, and the lower part to a depth of 60 inches or more is light gray very gravelly loam. Depth to gravelly or very gravelly material ranges from 40 to 60 inches.

Permeability is moderately slow. Available water capacity is high. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is about 30 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

This soil is used for nonirrigated crops, mainly wheat, barley, oats, alfalfa, and grass for hay and pasture. It is also used as rangeland.

This soil is well suited to nonirrigated crops. It is limited mainly by the hazards of soil blowing and water erosion and by low precipitation. Minimum tillage, contour cultivation, grassed waterways, stripcropping, and growing sod crops such as hay and pasture help to control soil blowing and water erosion.

The potential plant community on this soil is mainly bluebunch wheatgrass, green needlegrass, western wheatgrass, and needleandthread. If the range is excessively grazed, the proportion of some of these plants decreases and the proportion of western wheatgrass, needleandthread, Sandberg bluegrass, and blue grama increases. If excessive grazing continues, plants such as Kentucky bluegrass, timothy, clubmoss, and perennial weeds may invade. The potential plant community produces about 1,600 pounds of air-dry vegetation in years of above-normal precipitation and 800 pounds in years of below-normal precipitation.

This soil is suitable for seeding to adapted grasses and forbs if the range is in poor condition. Seedbed preparation and planting on the contour or across the slope, where practical, conserve moisture and help to control water erosion. The surface layer is susceptible to water erosion and soil blowing if it is disturbed or if the range is overgrazed.

This soil is well suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian crabapple, green ash, Siberian elm, white willow, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and cotoneaster. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings.

The main limitations for homesite development on this soil are moderately slow permeability, shrink-swell potential, potential frost action, and low soil strength. If the soil is used for septic tank absorption fields, the moderately slow permeability can be overcome by increasing the size of the absorption field. Shrinking and swelling, frost action, and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential.

This map unit is in capability subclass IIIe, nonirrigated, and in Silty range site, 15- to 19-inch precipitation zone.

165—Martinsdale-Judith loams, 4 to 8 percent slopes. This map unit is on terraces and fans in the northwestern part of the county. Slopes commonly are 250 to 1,000 feet long. Elevation is 3,500 to 3,800 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 120 days.

This unit is about 50 percent Martinsdale loam and 40 percent Judith loam. The Martinsdale soil is on plane and concave side slopes, and the Judith soil is in convex areas.

Included in this unit is about 10 percent deep, gravelly Windham soils in narrow, convex areas.

The Martinsdale soil is deep and well drained. It formed in alluvium derived dominantly from limestone. Typically, the surface layer is grayish brown loam about 6 inches thick. The subsoil is brown and grayish brown clay loam about 18 inches thick. The upper 19 inches of the substratum is light gray sandy clay loam, and the lower part to a depth of 60 inches or more is light gray very gravelly loam. Depth to very gravelly or extremely gravelly material ranges from 40 to 60 inches.

Permeability of the Martinsdale soil is moderately slow. Available water capacity is high. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is about 30 inches. Runoff is medium, and the hazard of water

erosion is moderate. The hazard of soil blowing is moderate.

The Judith soil is deep and well drained. It formed in alluvium derived dominantly from limestone. Typically, the surface layer is dark grayish brown loam about 6 inches thick. The upper 11 inches of the subsoil is brown and very pale brown clay loam, and the lower 7 inches is white clay loam. The upper 22 inches of the substratum is very pale brown extremely gravelly loam, and the lower part to a depth of 66 inches or more is very pale brown extremely gravelly sandy clay loam.

Permeability of the Judith soil is moderate to a depth of 24 inches and moderately rapid below this depth. Available water capacity is moderate. Effective rooting depth is 66 inches or more. The average annual wetting depth where this soil is under native vegetation is about 30 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high.

The soils in this unit are used for nonirrigated crops, mainly wheat, barley, oats, alfalfa, and grass for hay and pasture. They are also used as rangeland.

These soils are well suited to nonirrigated crops. They are limited mainly by the hazards of soil blowing and water erosion and by low precipitation. Minimum tillage, contour cultivation, grassed waterways, stripcropping, and growing sod crops such as hay and pasture help to control soil blowing and water erosion. Tall grass barriers trap snow, which increases the amount of moisture in the soil.

The potential plant community on the Martinsdale soil is mainly bluebunch wheatgrass, green needlegrass, western wheatgrass, and needleandthread. If the range is excessively grazed, the proportion of some of these plants decreases and the proportion of western wheatgrass, needleandthread, Sandberg bluegrass, and blue grama increases. If excessive grazing continues, plants such as Kentucky bluegrass, timothy, clubmoss, and perennial weeds may invade. The potential plant community produces about 1,600 pounds of air-dry vegetation in years of above-normal precipitation and 800 pounds in years of below-normal precipitation.

The potential plant community on the Judith soil is mainly bluebunch wheatgrass, green needlegrass, rough fescue, and western wheatgrass. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of Idaho fescue, needleandthread, western wheatgrass, and blue grama increases. If excessive grazing continues, plants such as timothy, Kentucky bluegrass, clubmoss, and perennial weeds may invade. The potential plant community produces about 2,200 pounds of air-dry vegetation in years of above-normal precipitation and 1,700 pounds in years of below-normal precipitation.

This soil is suitable for seeding to adapted grasses and forbs if the range is in poor condition. Seedbed preparation and planting on the contour or across the slope, where practical, conserve moisture and help to control water erosion. The surface layer is susceptible to water erosion and soil blowing if it is disturbed or if the range is overgrazed.

The Martinsdale soil is well suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian crabapple, green ash, Siberian elm, white willow, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and cotoneaster.

The Judith soil is suited to windbreaks, but the high concentration of lime at a depth of less than 15 inches and the limited moisture supply restrict the choice of trees and shrubs. Suitable trees for planting are Russian-olive, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, and skunkbush sumac.

Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings on these soils. Planting on the contour helps to conserve moisture.

The main limitations for homesite development on the soils in this unit are potential frost action, low soil strength, and the moderately slow permeability of the Martinsdale soil. If the Martinsdale soil is used for septic tank absorption fields, the moderately slow permeability can be overcome by increasing the size of the absorption field. Frost action and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. The very gravelly or extremely gravelly material below a depth of 24 to 40 inches in the Judith soil is a good source of roadfill.

This map unit is in capability subclass IIIe, nonirrigated, and in Silty range site, 15- to 19-inch precipitation zone.

166—Marvan silty clay, 0 to 2 percent slopes. This deep, well drained soil is on terraces and fans in the eastern part of the county. It formed in alluvium derived dominantly from shale. Slopes commonly are more than 1,000 feet long. Elevation is 2,300 to 3,600 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 44 degrees F, and the average frost-free period is about 130 days.

Included in this unit are small areas of Vanda soils that are deep, are salt- and alkali-affected, and have a crusty surface layer.

Typically, the surface layer of this Marvan soil is grayish brown silty clay about 5 inches thick. The underlying material to a depth of 60 inches or more is grayish brown silty clay.

Permeability is very slow. Available water capacity is moderate. This soil is salt- and alkali-affected in the underlying material. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is about 22 inches. Runoff

is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high.

This soil is used mainly as rangeland and for hay and pasture. It is also used for nonirrigated crops such as wheat, barley, and oats.

This soil is suited to nonirrigated crops. It is limited mainly by the saline underlying material, the hazard of soil blowing, and low precipitation. Because precipitation is not sufficient for annual cropping, a cropping system that includes small grains and summer fallow is best. Subsoiling improves water infiltration and allows salts to be leached downward. Suitable practices for controlling soil blowing are stripcropping, tall grass barriers, field windbreaks, minimum tillage, stubble-mulch tillage, and growing sod crops such as hay and pasture.

The potential plant community on this soil is mainly western wheatgrass, green needlegrass, bluebunch wheatgrass, and thickspike wheatgrass. If the range is excessively grazed, the proportion of these plants decreases and the proportion of plains reedgrass, Sandberg bluegrass, prairie junegrass, and big sagebrush increases. If excessive grazing continues, plants such as perennial weeds, broom snakeweed, curlycup gumweed, and annual bromes may invade. The potential plant community produces about 1,100 pounds of air-dry vegetation in years of above-normal precipitation and 700 pounds in years of below-normal precipitation.

This soil is suitable for seeding to adapted grasses and forbs if the range is in poor condition. The surface layer is susceptible to soil blowing if it is disturbed or if the range is overgrazed.

This soil is suited to windbreaks, but it is moderately saline, which limits the choice of trees and shrubs to those that are salt tolerant. Suitable trees for planting are Russian-olive, black hawthorn, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, common chokecherry, skunkbush sumac, and silver buffaloberry. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings.

The main limitations for homesite development on this soil are very slow permeability, salinity, shrink-swell potential, corrosivity to concrete, and low soil strength. If the soil is used for septic tank absorption fields, the very slow permeability can be overcome by increasing the size of the absorption field. Shrinking and swelling and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential. Use of salt-resistant concrete is necessary to overcome the corrosivity.

This map unit is in capability subclass IVs, nonirrigated, and in Clayey range site, 10- to 14-inch precipitation zone.

167—Marvan silty clay, 2 to 8 percent slopes. This deep, well drained soil is on fans in the eastern part of the county. It formed in alluvium derived dominantly from shale. Slopes commonly are 250 to 1,000 feet long. Elevation is 2,300 to 3,600 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 44 degrees F, and the average frost-free period is about 130 days.

Included in this unit are small areas of deep Vanda and Nobe soils, along drainageways, that are salt- and alkali-affected and have a crusty surface layer. Also included are small areas of soils that are dissected by drainageways. The Nobe soils support little if any vegetation.

Typically, the surface layer of this Marvan soil is grayish brown silty clay about 5 inches thick. The underlying material to a depth of 60 inches or more is grayish brown silty clay.

Permeability is very slow. Available water capacity is moderate. This soil is salt- and alkali-affected in the underlying material. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is about 22 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high.

This soil is used mainly as rangeland and for hay and pasture. It is also used for nonirrigated crops such as wheat, barley, and oats.

This soil is suited to nonirrigated crops. It is limited mainly by the salt- and alkali-affected underlying material, the hazards of soil blowing and water erosion, and low precipitation. Because precipitation is not sufficient for annual cropping, a cropping system that includes small grains and summer fallow is best. Minimum tillage, contour cultivation, stripcropping, tall grass barriers, grassed waterways, return of crop residue to the soil, and growing sod crops such as hay and pasture help to control soil blowing and water erosion. Tall grass barriers also reduce evaporation and trap snow, which increases the amount of moisture in the soil. Return of crop residue also helps to maintain good soil tilth. Chiseling through stubble in fall on the contour or across the slope helps to control water erosion.

The potential plant community on this soil is mainly western wheatgrass, green needlegrass, bluebunch wheatgrass, and thickspike wheatgrass. If the range is excessively grazed, the proportion of these plants decreases and the proportion of plains reedgrass, Sandberg bluegrass, prairie junegrass, and big sagebrush increases. If excessive grazing continues, plants such as perennial weeds, broom snakeweed, curlycup gumweed, and annual bromes may invade. The potential plant community produces about 1,100 pounds

of air-dry vegetation in years of above-normal precipitation and 700 pounds in years of below-normal precipitation.

This soil is suitable for seeding to adapted grasses and forbs if the range is in poor condition. Seedbed preparation and planting on the contour or across the slope, where practical, conserve moisture and help to control water erosion. The surface layer is susceptible to water erosion and soil blowing if it is disturbed or if the range is overgrazed.

This soil is suited to windbreaks, but it is moderately saline, which limits the choice of trees and shrubs to those that are salt tolerant. Suitable trees for planting are Russian-olive, black hawthorn, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, common chokecherry, skunkbush sumac, and silver buffaloberry. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings. Planting on the contour helps to conserve moisture.

The main limitations for homesite development on this soil are very slow permeability, salinity, shrink-swell potential, corrosivity to concrete, and low soil strength. If the soil is used for septic tank absorption fields, the very slow permeability can be overcome by increasing the size of the absorption field. Shrinking and swelling and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential. Use of a salt-resistant concrete is necessary to overcome the limitation of corrosivity.

This map unit is in capability subclass IVe, nonirrigated, and in Clayey range site, 10- to 14-inch precipitation zone.

168—Mocmont very gravelly loam, 15 to 60 percent slopes. This deep, well drained soil is on mountainsides in the central part of the county. It formed in alluvium and colluvium derived dominantly from igneous rock. Slopes commonly are more than 1,000 feet long. Elevation is 4,500 to 6,000 feet. The average annual precipitation is about 20 inches, the average annual air temperature is about 42 degrees F, and the average frost-free period is about 100 days.

Included in this unit are small areas of soils that are similar to this Mocmont soil but have bedrock at a depth of 20 to 40 inches and small areas of soils that have bedrock at a depth of less than 20 inches. Also included are small outcroppings of igneous rock and sandstone on ridges.

Typically, the surface of this Mocmont soil is covered by a mat of forest litter of undecomposed and decomposed needles, twigs, cones, and leaves 2 inches thick. The surface layer is very pale brown very gravelly loam about 12 inches thick. The upper 26 inches of the subsoil is light yellowish brown and pale brown extremely gravelly clay loam, and the lower part to a depth of 60 inches or more is pale brown extremely cobbly loam.

Permeability is moderately rapid. Available water capacity is very low to low. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is 60 inches or more. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

Most areas of this soil are used for livestock grazing. A few areas are used as woodland.

This soil is poorly suited to cultivated crops and to hay and pasture because of steepness of slope and rough topography.

This soil is forested. It is suited to livestock grazing. The potential native understory vegetation is dominated by pinegrass, white spirea, Oregon-grape, common juniper, mallow ninebark, northern bedstraw, and wildbergamot horsemint. The understory provides moderate amounts of forage for livestock. Slopes of 45 to 60 percent adversely affect the distribution and management of livestock.

This soil is suited to the production of ponderosa pine and Douglas-fir. The site index is about 60 for ponderosa pine and 36 for Douglas-fir. At the culmination of the mean annual increment (CMAI), this soil can produce about 45 cubic feet, or 135 board feet, of ponderosa pine and 45 cubic feet, or 140 board feet (Schribner rule), of Douglas-fir per acre per year. Potential production is estimated for an even-aged, fully stocked stand of trees.

Seedling mortality is severe, plant competition is severe, and the hazard of windthrow is slight. Where slopes are 15 to 30 percent, the hazard of erosion and equipment limitations are slight. Where slopes are 30 to 60 percent, the hazard of erosion and equipment limitations are moderate.

The main limitations of the soil for management of timber are steepness of slope and very low to low available water capacity. Slopes of 30 to 60 percent restrict the kind of equipment that can be used and make its operation difficult. Competition from understory vegetation and low available water capacity make establishment of tree seedlings difficult.

This soil in places supports dense stands of trees. Because of the large number of trees, root development is restricted and trees are subject to windthrow. Maintaining small openings and thinning over a period of several years reduce windthrow. Maintaining adequate plant cover on the disturbed areas and using sediment filter strips of undisturbed vegetation along streams reduce soil erosion and problems of water quality.

The main limitations for homesite development on this soil are slope and content of rock fragments. Slope is a

concern in installing septic tank absorption fields. Absorption lines should be installed on the contour. Effluent from septic tank absorption fields can surface in downslope areas and thus create a hazard to health. Removal of pebbles and cobbles in disturbed areas is needed for best results when landscaping, particularly in areas used for lawns.

This map unit is in capability subclass VIIe, nonirrigated. the Mocmont soil is in woodland suitability group 5o10 where slopes are 15 to 30 percent and group 5r16 where slopes are 30 to 60 percent.

169—Mocmont-Lipke association, steep. This map unit is on uplands in the southern part of the county. Slope is 15 to 45 percent. Slopes commonly are more than 1,000 feet long. Elevation is 4,200 to 5,300 feet. The average annual precipitation is about 20 inches, the average annual air temperature is about 42 degrees F, and the average frost-free period is about 100 days.

This unit is about 45 percent Mocmont very flaggy sandy loam and 40 percent Lipke clay loam. The Mocmont soil is on uplands. The Lipke soil is on foot slopes.

Included in this unit is about 15 percent soils that are similar to the Lipke soil but are 40 to 60 inches deep over shale.

The Mocmont soil is deep and well drained. It formed in alluvium, colluvium, and residuum derived dominantly from sandstone. Typically, the surface is covered by a mat of forest litter of undecomposed and decomposed needles, twigs, and cones. The surface layer is very pale brown very flaggy sandy loam about 6 inches thick. The next layer is pinkish gray very flaggy sandy loam about 8 inches thick. The upper 20 inches of the subsoil is brown very flaggy sandy clay loam, and the lower part to a depth of 60 inches or more is light gray very flaggy sandy loam.

Permeability of the Mocmont soil is moderately rapid. Available water capacity is very low to low. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is 60 inches or more. Runoff is medium, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

The Lipke soil is deep and well drained. It formed in alluvium and residuum derived dominantly from shale. Typically, the surface is covered by a mat of pine cones, needles, twigs, and humus about 2 inches thick. The surface layer is dark grayish brown loam about 1 inch thick. The next layer is dark grayish brown and grayish brown clay loam about 11 inches thick. The upper 8 inches of the subsoil is light brownish gray clay, and the lower 22 inches is brown and pale brown clay. The substratum to a depth of 60 inches or more is light yellowish brown and gray clay.

Permeability of the Lipke soil is very slow. Available water capacity is high. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is 60 inches or more. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

The soils in this unit are used mainly for livestock grazing. They are also used as woodland.

These soils are poorly suited to cultivated crops and to hay and pasture because of steepness of slope and rough topography.

These soils are forested. They are suited to livestock grazing. The potential native understory vegetation on the Mocmont soil is dominated by kinnikinnick, common juniper, white spirea, pinegrass, russet buffaloberry, Idaho fescue, arrowleaf balsamroot, Oregon-grape, western meadowrue, and heartleaf arnica. The understory provides moderate amounts of forage for livestock.

The Mocmont soil is suited to the production of ponderosa pine and Douglas-fir. The site index is about 65 for ponderosa pine and 38 for Douglas-fir. At the culmination of the mean annual increment (CMAI), the Mocmont soil can produce about 50 cubic feet, or 150 board feet, of ponderosa pine and 50 cubic feet, or 150 board feet (Scribner rule), of Douglas-fir per acre per year. Potential production is estimated for an even-aged, fully stocked stand of trees.

Seedling mortality is moderate, plant competition is severe, and the hazard of windthrow is slight. Where slopes are 15 to 25 percent, the hazard of erosion and equipment limitations are slight. Where slopes are 25 to 45 percent, the hazard of erosion and equipment limitations are moderate.

The main limitations of the Mocmont soil for management of timber are steepness of slope and very low to low available water capacity. Where slopes are 25 to 45 percent, maintaining adequate plant cover on disturbed areas and using sediment filter strips of undisturbed vegetation along streams reduce soil erosion and problems of water quality. Competition from understory vegetation and low available water capacity make establishment of tree seedlings difficult. Reduction of plant competition helps in establishing seedlings.

The potential native understory vegetation on the Lipke soil is dominated by Oregon-grape, common snowberry, white spirea, common chokecherry, Saskatoon serviceberry, heartleaf arnica, blue wildrye, northern bedstraw, western meadowrue, Engelmann aster, starry false solomonseal, and Canada violet. The understory provides moderate amounts of forage for livestock.

The Lipke soil is suited to the production of ponderosa pine and Douglas-fir. The site index is about 78 for ponderosa pine and 37 for Douglas-fir. At the culmination of the mean annual increment (CMAI), the Lipke soil can produce about 65 cubic feet, or 220 board feet, of ponderosa pine and 45 cubic feet, or 140 board feet (Scribner rule), of Douglas-fir per acre per year.

Potential production is estimated for an even-aged, fully stocked stand of trees.

Seedling mortality is slight, plant competition is moderate, and the hazard of windthrow is moderate. Where slopes are 15 to 25 percent, the hazard of erosion and equipment limitations are moderate. Where slopes are 25 to 45 percent, the hazard of erosion and equipment limitations are severe.

The main limitations of the Lipke soil for management of timber are permeability, steepness of slope, soil texture, and low soil strength. Slow permeability and steepness of slope increase the hazard of erosion. Maintaining adequate plant cover on disturbed areas and using sediment filter strips of undisturbed vegetation along streams reduce soil erosion and problems of water quality. The soil has low strength when wet, which results in poor trafficability and in soil compaction if heavy equipment is used to yard logs. Operating equipment when the soil is dry or frozen overcomes these limitations. Reduction of plant competition helps in establishing seedlings.

The soils in this unit are poorly suited to homesite development. The main limitations on the Mocmont soil are slope and content of rock fragments. Slope is a concern in installing septic tank absorption fields. Absorption lines should be installed on the contour. Removal of pebbles and cobbles in disturbed areas is needed for best results when landscaping, particularly in areas used for lawns.

The main limitations for homesite development on the Lipke soil are very slow permeability, slope, shrink-swell potential, and low soil strength. If the soil is used for septic tank absorption fields, the slope and very slow permeability can be overcome by increasing the length of the absorption lines and by installing them on the contour. Shrinking and swelling and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential.

This map unit is in capability subclass VIIe, nonirrigated. The Mocmont soil is in woodland suitability group 5o10 where slopes are 15 to 25 percent and group 5r16 where slopes are 25 to 45 percent. The Lipke soil is in woodland suitability group 4c2 where slopes are 15 to 25 percent and group 4c4 where slopes are 25 to 45 percent.

170—Mocmont-Oraid complex, 2 to 25 percent slopes. This map unit is on uplands in the southern part of the county. Slopes commonly are more than 1,000 feet long. Elevation is 4,200 to 5,300 feet. The average annual precipitation is about 20 inches, the average annual air temperature is about 42 degrees F, and the average frost-free period is about 100 days.

This unit is about 50 percent Mocmont flaggy sandy loam and 40 percent Oraid extremely flaggy sandy loam. The Mocmont soil is on plane side slopes, and the Oraid soil is in convex areas.

Included in this unit are small areas of Mocmont sandy loam and Mocmont channery sandy loam. Included areas make up about 10 percent of the total acreage.

The Mocmont soil is deep and well drained. It formed in alluvium, colluvium, and residuum derived dominantly from sandstone. Typically, the surface is covered by a mat of forest litter of undecomposed and decomposed needles, twigs, and cones about 2 inches thick. The surface layer is very pale brown flaggy sandy loam about 6 inches thick. The next layer is pinkish gray flaggy sandy loam about 8 inches thick. The upper 20 inches of the subsoil is brown very flaggy sandy clay loam, and the lower part to a depth of 60 inches or more is light gray very flaggy sandy loam.

Permeability of the Mocmont soil is moderately rapid. Available water capacity is very low to low. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is 60 inches or more. Runoff is medium, and the hazard of water erosion is high. The hazard of soil blowing is high.

The Oraid soil is moderately deep and somewhat excessively drained. It formed in residuum derived dominantly from fractured hard sandstone. Typically, the surface is covered by a mat of forest litter of undecomposed and decomposed needles, twigs, and cones about 1 1/2 inches thick. The surface layer is light brown extremely flaggy sandy loam about 2 1/2 inches thick. The next layer is light yellowish brown, very pale brown, and pale brown extremely flaggy loamy sand about 22 1/2 inches thick. Very pale brown and light yellowish brown sandstone is at a depth of 25 inches. Depth to sandstone ranges from 20 to 40 inches.

Permeability of the Oraid soil is moderately rapid. Available water capacity is very low. Effective rooting depth is 20 to 40 inches. The average annual wetting depth where this soil is under native vegetation is 20 to 40 inches. Runoff is medium, and the hazard of water erosion is high. The hazard of soil blowing is high.

The soils in this unit are used mainly for livestock grazing. They are also used as woodland.

These soils are poorly suited to cultivated crops and to hay and pasture because of large stones in the surface layer, the hazard of soil blowing, and droughtiness.

The Mocmont and Oraid soils are forested. They are suited to livestock grazing. The potential native understory vegetation on the Mocmont soil is dominated by kinnikinnick, common juniper, white spirea, pinegrass, russet buffaloberry, Idaho fescue, arrowleaf balsamroot, Oregon-grape, western meadowrue, and heartleaf arnica.

The understory provides moderate amounts of forage for livestock.

The Mocmont soil is suited to the production of ponderosa pine and Douglas-fir. The site index is about 65 for ponderosa pine and 38 for Douglas-fir. At the culmination of the mean annual increment (CMAI), the Mocmont soil can produce about 50 cubic feet, or 150 board feet, of ponderosa pine and 50 cubic feet, or 150 board feet (Scribner rule), of Douglas-fir per acre per year. Potential production is estimated for an even-aged, fully stocked stand of trees.

The hazard of erosion is slight, equipment limitations are slight, seedling mortality is moderate, plant competition is severe, and the hazard of windthrow is slight.

The main limitation of the Mocmont soil for management of timber is very low to low available water capacity. Maintaining adequate plant cover on disturbed areas and using sediment filter strips of undisturbed vegetation along streams reduce soil erosion and problems of water quality. Competition from understory vegetation and low available water capacity make establishment of tree seedlings difficult. Reduction of plant competition helps in establishing seedlings.

The potential native understory vegetation on the Oraid soil is dominated by arrowleaf balsamroot, common snowberry, common chokecherry, Saskatoon serviceberry, Idaho fescue, Columbia needlegrass, bluebunch wheatgrass, western yarrow, and sedge. The understory provides limited amounts of forage for livestock.

The Oraid soil is suited to the production of ponderosa pine. The site index is about 56 for ponderosa pine. At the culmination of the mean annual increment (CMAI), the Oraid soil can produce about 40 cubic feet, or 110 board feet (Scribner rule), of ponderosa pine per acre per year. Potential production is estimated for an even-aged, fully stocked stand of trees.

The hazard of erosion is slight, equipment limitations are slight, seedling mortality is severe, plant competition is severe, and the hazard of windthrow is severe.

The main limitations of the Oraid soil for management of timber are moderate depth to sandstone and very low available water capacity. Competition from understory vegetation and very low available water capacity make establishment of tree seedlings difficult. The limited soil depth restricts development of plant roots, which results in the trees being subject to windthrow. Maintaining small openings or progressively removing trees over a period of several years reduces windthrow.

The Mocmont soil is well suited to homesite development where slopes are 2 to 15 percent and poorly suited where slopes are 15 to 25 percent. Slope is a concern in installing septic tank absorption fields. Absorption lines should be installed on the contour.

The main limitations for homesite development on the Oraid soil are slopes o more than 15 percent, moderate depth to sandstone, and content of rock fragments. The Oraid soil is severely limited for septic tank absorption fields because of slope and the moderate depth to sandstone. Cuts to provide building sites can expose sandstone. Removal of pebbles and cobbles in disturbed areas is needed for best results when landscaping, particularly in areas used for lawns.

This map unit is in capability subclass VIe, nonirrigated. The Mocmont soil is in woodland suitability group 5o2, and the Oraid soil is in group 6f6.

171—Mocmont-Oraid complex, 25 to 60 percent slopes. This map unit is on uplands in the southern part of the county. Slopes commonly are 250 to 1,000 feet long. Elevation is 4,200 to 5,300 feet. The average annual precipitation is about 20 inches, the average annual air temperature is about 42 degrees F, and the average frost-free period is about 100 days.

This unit is about 45 percent Mocmont very flaggy sandy loam and 40 percent Oraid extremely flaggy loamy sand. The Mocmont soil is in concave or plane areas on uplands, and the Oraid soil is in convex areas on uplands.

Included in this unit are small areas of Mocmont and Oraid soils that have slopes of more than 60 percent and small areas of Rock outcrop. Included areas make up about 15 percent of the total acreage.

The Mocmont soil is deep and well drained. It formed in alluvium, colluvium, and residuum derived dominantly from sandstone. Typically, the surface is covered by forest litter of undecomposed and decomposed needles, twigs, and cones. The surface layer is very pale brown very flaggy sandy loam about 6 inches thick. The next layer is pinkish gray very flaggy sandy loam about 8 inches thick. The upper 20 inches of the subsoil is brown very flaggy sandy clay loam, and the lower part to a depth of 60 inches or more is light gray very flaggy sandy loam.

Permeability of the Mocmont soil is moderately rapid. Available water capacity is very low to low. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is 60 inches or more. Runoff is medium, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

The Oraid soil is moderately deep and somewhat excessively drained. It formed in residuum derived dominantly from fractured hard sandstone. Typically, the surface is covered by a mat of forest litter of undecomposed and decomposed needles, twigs, and cones about 1 1/2 inches thick. The surface layer is light brown extremely flaggy sandy loam about 2 1/2 inches thick. The next layer is light yellowish brown and very pale brown extremely flaggy loamy sand about 22 1/2 inches thick. Very pale brown and light yellowish brown sandstone is at a depth of 25 inches. Depth to sandstone ranges from 20 to 40 inches.

Permeability of the Oraid soil is moderately rapid. Available water capacity is very low. Effective rooting depth is 20 to 40 inches. The average annual wetting depth where this soil is under native vegetation is 20 to 40 inches. Runoff is medium, and the hazard of water erosion is high. The hazard of soil blowing is high.

The soils in this unit are used mainly for livestock grazing. They are also used as woodland.

These soils are poorly suited to cultivated crops and to hay and pasture because of steepness of slope and rough topography.

The Mocmont and Oraid soils are forested. They are suited to livestock grazing. The potential native understory vegetation on the Mocmont soil is dominated by kinnikinnick, common juniper, white spirea, pinegrass, russet buffaloberry, Idaho fescue, arrowleaf balsamroot, Oregon-grape, western meadowrue, and heartleaf arnica. The understory provides moderate amounts of forage for livestock.

The Mocmont soil is suited to the production of ponderosa pine and Douglas-fir. The site index is about 65 for ponderosa pine and 38 for Douglas-fir. At the culmination of the mean annual increment (CMAI), the Mocmont soil can produce about 50 cubic feet, or 150 board feet, of ponderosa pine and 50 cubic feet, or 150 board feet (Scribner rule), of Douglas-fir per acre per year. Potential production is estimated for an even-aged, fully stocked stand of trees.

The hazard of erosion is severe, equipment limitations are moderate, seedling mortality is moderate, plant competition is severe, and the hazard of windthrow is slight.

The main limitations of the Mocmont soil for management of timber are steepness of slope and very low and low available water capacity. Maintaining adequate plant cover on disturbed areas and using sediment filter strips of undisturbed vegetation along streams reduce soil erosion and problems of water quality. Competition from understory vegetation and low available water capacity make establishment of tree seedlings difficult. Reduction of plant competition helps in establishing seedlings.

The potential native understory vegetation on the Oraid soil is dominated by arrowleaf balsamroot, common snowberry, common chokecherry, Saskatoon serviceberry, Idaho fescue, Columbia needlegrass, bluebunch wheatgrass, western yarrow, and sedge. The understory provides limited amounts of forage for livestock.

The Oraid soil is suited to the production of ponderosa pine. The site index is about 56 for ponderosa pine. At the culmination of the mean annual increment (CMAI), the Oraid soil can produce about 40 cubic feet, or 110 board feet (Scribner rule), of ponderosa pine per acre per year. Potential production is estimated for an even-aged, fully stocked stand of trees.

The hazard of erosion is moderate, equipment limitations are moderate, seedling mortality is severe, plant competition is severe, and the hazard of windthrow is severe.

The main limitations of the Oraid soil for management of timber are steepness of slope, moderate depth to sandstone, and very low available water capacity. Maintaining adequate plant cover on disturbed areas and using sediment filter strips of undisturbed vegetation along streams reduce soil erosion and problems of water quality. Competition from understory vegetation and very low available water capacity make establishment of tree seedlings difficult. The limited soil depth restricts development of plant roots, which results in the trees being subject to windthrow. Maintaining small openings or progressively removing trees over a period of several years reduces windthrow.

The soils in this unit are poorly suited to homesite development because of the steepness of slope and the moderate depth to sandstone in the Oraid soil.

This map unit is in capability subclass VIIe, nonirrigated. The Mocmont soil is in woodland suitability group 5r14, and the Oraid soil is in group 6f8.

172—Mocmont-Oraid complex, warm, 4 to 60 percent slopes. This map unit is on south-facing side slopes of uplands in the southern part of the county. Slopes commonly are more than 1,000 feet long. Elevation is 4,200 to 5,300 feet. The average annual precipitation is about 20 inches, the average annual air temperature is about 42 degrees F, and the average frost-free period is about 100 days.

This unit is about 45 percent Mocmont flaggy sandy loam and 30 percent Oraid extremely flaggy loamy sand. The Mocmont soil is in concave and plane areas on uplands, and the Oraid soil is in convex areas on uplands.

Included in this unit are small areas of deep Roy soils in plane and concave areas and small areas of shallow Castner soils on ridges. Included areas make up about 25 percent of the total acreage.

The Mocmont soil is deep and well drained. It formed in alluvium, colluvium, and residuum derived dominantly from sandstone. Typically, the surface is covered by a mat of forest litter of undecomposed and decomposed needles, twigs, and cones about 2 inches thick. The surface layer is very pale brown flaggy sandy loam about 6 inches thick. The next layer is pinkish gray flaggy sandy loam about 8 inches thick. The upper 20 inches of the subsoil is brown very flaggy sandy clay loam, and the lower part to a depth of 60 inches or more is light gray very flaggy sandy loam.

Permeability of the Mocmont soil is moderately rapid. Available water capacity is very low to low. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is 60 inches or more. Runoff is medium, and the hazard

of water erosion is high. The hazard of soil blowing is high.

The Oraid soil is moderately deep and somewhat excessively drained. It formed in residuum derived dominantly from fractured hard sandstone. Typically, the surface is covered by a mat of forest litter of undecomposed and decomposed needles, twigs, and cones about 1 1/2 inches thick. The surface layer is light brown extremely flaggy sandy loam about 2 1/2 inches thick. The next layer is light yellowish brown and very pale brown extremely flaggy loamy sand about 22 1/2 inches thick. Very pale brown and light yellowish brown sandstone is at a depth of 25 inches. Depth to sandstone ranges from 20 to 40 inches.

Permeability of the Oraid soil is moderately rapid. Available water capacity is very low. Effective rooting depth is 20 to 40 inches. The average annual wetting depth where this soil is under native vegetation is 20 to 40 inches. Runoff is medium, and the hazard of water erosion is high. The hazard of soil blowing is high.

The soils in this unit are used mainly for livestock grazing. They are also used as woodland.

These soils are poorly suited to cultivated crops and to hay and pasture because of large stones in the surface layer, slope, the hazard of soil blowing, and droughtiness.

The Mocmont and Oraid soils are forested. They are suited to livestock grazing. The potential native understory vegetation on the Mocmont soil where it is on south-facing side slopes is dominated by arrowleaf balsamroot, common snowberry, common chokecherry, Saskatoon serviceberry, Idaho fescue, Columbia needlegrass, bluebunch wheatgrass, western yarrow, and sedge. The understory provides moderate amounts of forage for livestock.

Where the Mocmont soil is on south-facing side slopes, it is suited to the production of ponderosa pine. The site index is about 50 for ponderosa pine. At the culmination of the mean annual increment (CMAI), the Mocmont soil can produce about 35 cubic feet, or 90 board feet (Scribner rule), of ponderosa pine per acre per year. Potential production is estimated for an even-aged, fully stocked stand of trees.

Seedling mortality is severe, plant competition is severe, and the hazard of windthrow is slight. Where slopes are 4 to 25 percent, the hazard of erosion and equipment limitations are slight. Where slopes are 25 to 60 percent, the hazard of erosion and equipment limitations are moderate.

The main limitations of the Mocmont soil for management of timber are steepness of slope and very low to low available water capacity. Where slopes are 25 to 60 percent, maintaining adequate plant cover on disturbed areas and using sediment filter strips of undisturbed vegetation along streams reduce soil erosion and problems of water quality. Competition from understory vegetation and low available water capacity make establishment of tree seedlings difficult. Reduction of plant competition helps in establishing seedlings.

The potential native understory vegetation where the Oraid soil is on south-facing side slopes is dominated by bluebunch wheatgrass, Idaho fescue, arrowleaf balsamroot, and western yarrow. The understory provides limited amounts of forage for livestock.

Where the Oraid soil is on south-facing side slopes, it is suited to the production of ponderosa pine. The site index is about 40 for ponderosa pine. At the culmination of the mean annual increment (CMAI), the Oraid soil can produce about 30 cubic feet, or 55 board feet (Scribner rule), of ponderosa pine per acre per year. Potential production is estimated for an even-aged, fully stocked stand of trees.

Seedling mortality is severe, plant competition is severe, and the hazard of windthrow is severe. Where slopes are 4 to 25 percent, the hazard of erosion and equipment limitations are slight. Where slopes are 25 to 60 percent, the hazard of erosion and equipment limitations are moderate.

The main limitations of the Oraid soil for management of timber are steepness of slope, moderate depth to sandstone, and very low available water capacity. Where slopes are 25 to 60 percent, maintaining adequate plant cover on disturbed areas and using sediment filter strips of undisturbed vegetation along streams reduce soil erosion and problems of water quality. Competition from understory vegetation and very low available water capacity make establishment of tree seedlings difficult. The limited soil depth restricts development of plant roots, which results in the trees being subject to windthrow. Maintaining small openings or progressively removing trees over a period of several years reduces windthrow.

The Mocmont soil is well suited to homesite development where slopes are 4 to 15 percent and poorly suited where slopes are 15 to 60 percent. Slope is a concern in installing septic tank absorption fields. Absorption lines should be installed on the contour.

The Oraid soil is poorly suited to homesite development. The main limitations are slopes of more than 15 percent, moderate depth to sandstone, and content of rock fragments.

This map unit is in capability subclass VIIe, nonirrigated. The south-facing slopes of the Mocmont soil are in woodland suitability group 6o8 where slopes are 4 to 25 percent and group 6r6 where slopes are 25 to 60 percent. The south-facing slopes of the Oraid soil are in woodland suitability group 7f2 where slopes are 4 to 25 percent and group 7f4 where slopes are 25 to 60 percent.

173—Mocmont-Roy flaggy loams, 15 to 45 percent slopes. This map unit is on uplands in the central part of the county. Slopes commonly are more than 1,000 feet long. Elevation is 4,200 to 5,300 feet. The average

annual precipitation is about 19 inches, the average annual air temperature is about 42 degrees F, and the average frost-free period is about 105 days.

This unit is about 30 percent Mocmont flaggy loam on south-facing side slopes, 15 percent Mocmont flaggy loam on north-facing side slopes, and 40 percent Roy flaggy loam, mainly on south-facing side slopes. The Mocmont soil is on uplands, and the Roy soil is on foot slopes.

Included in this unit are small areas of shallow Castner soils and moderately deep Oraid soils on convex side slopes. Also included are small areas of Rock outcrop. Included areas make up about 15 percent of the total acreage.

The Mocmont soil is deep and well drained. It formed in alluvium, colluvium, and residuum derived dominantly from sandstone. Typically, the surface is covered by a mat of forest litter of undecomposed and decomposed needles, twigs, and cones. The surface layer is very pale brown flaggy loam about 6 inches thick. The next layer is pinkish gray flaggy sandy loam about 8 inches thick. The upper 20 inches of the subsoil is brown very flaggy sandy clay loam, and the lower part to a depth of 60 inches or more is light gray very flaggy sandy loam.

Permeability of the Mocmont soil is moderately rapid. Available water capacity is very low to low. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is 60 inches or more. Runoff is medium, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

The Roy soil is deep and well drained. It formed in alluvium derived from mixed rock sources. Typically, the surface layer is dark grayish brown flaggy loam about 7 inches thick. The subsoil is brown and grayish brown very cobbly clay loam about 17 inches thick. The substratum to a depth of 60 inches or more is light brownish gray and grayish brown extremely cobbly clay loam.

Permeability of the Roy soil is moderately slow. Available water capacity is low. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is about 26 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

Most areas of this unit are used for livestock grazing. A few areas are used as woodland.

The soils in this unit are poorly suited to cultivated crops and to hay and pasture because of steepness of slope and rough topography.

The potential plant community on the Roy soil is mainly bluebunch wheatgrass, green needlegrass, rough fescue, and western wheatgrass. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of Idaho fescue, needleandthread, western wheatgrass, and blue grama increases. If excessive grazing continues, plants such as timothy, Kentucky bluegrass, clubmoss, and perennial weeds may invade. The potential plant community produces about 2,400 pounds of air-dry vegetation in years of above-normal precipitation and 1,500 pounds in years of below-normal precipitation.

The Mocmont soil is forested. It is suited to livestock grazing. The potential native understory vegetation where the Mocmont soil is on south-facing side slopes is dominated by arrowleaf balsamroot, common snowberry, common chokecherry, Saskatoon serviceberry, Idaho fescue, Columbia needlegrass, bluebunch wheatgrass, western yarrow, and sedge. The understory provides moderate amounts of forage for livestock.

Where the Mocmont soil is on south-facing side slopes, it is suited to the production of ponderosa pine. The site index is about 50 for ponderosa pine. At the culmination of the mean annual increment (CMAI), the soil can produce about 35 cubic feet, or 90 board feet (Scribner rule), of ponderosa pine per acre per year. Potential production is estimated for an even-aged, fully stocked stand of trees.

Seedling mortality is severe, plant competition is severe, and the hazard of windthrow is slight. Where slopes are 15 to 25 percent, the hazard of erosion and equipment limitations are slight. Where slopes are 25 to 45 percent, the hazard of erosion and equipment limitations are moderate.

The potential native understory vegetation where the Mocmont soil is on north-facing slopes is dominated by kinnikinnick, common juniper, white spirea, pinegrass, russet buffaloberry, Idaho fescue, arrowleaf balsamroot, Oregon-grape, western meadowrue, and heartleaf arnica. The understory provides moderate amounts of forage for livestock.

Where the Mocmont soil is on north-facing slopes, it is suited to the production of ponderosa pine and Douglas-fir. The site index is about 65 for ponderosa pine and 38 for Douglas-fir. At the culmination of the mean annual increment (CMAI), the soil can produce about 50 cubic feet, or 150 board feet, of ponderosa pine and 50 cubic feet, or 150 board feet (Scribner rule), of Douglas-fir per acre per year. Potential production is estimated for an even-aged, fully stocked stand of trees.

Seedling mortality is moderate, plant competition is severe, and the hazard of windthrow is slight. Where slopes are 15 to 25 percent, the hazard of erosion and equipment limitations are slight. Where slopes are 25 to 45 percent, the hazard of erosion and equipment limitations are moderate.

The main limitations of the Mocmont soil for management of timber are steepness of slope and very low to low available water capacity. Where slopes are 25 to 45 percent, maintaining adequate plant cover on disturbed areas and using sediment filter strips of undisturbed vegetation along streams reduce soil erosion and problems of water quality. Competition from understory vegetation and low available water capacity

make establishment of tree seedlings difficult. Reduction of plant competition helps in establishing seedlings.

The Roy soil is poorly suited to windbreaks. It is limited mainly by slope.

The soils in this unit are poorly suited to homesite development. The main limitations on the Mocmont soil are slope and content of rock fragments. Slope is a concern in installing septic tank absorption fields. Absorption lines should be installed on the contour. Removal of pebbles and cobbles in disturbed areas is needed for best results when landscaping, particularly in areas used for lawns.

The main limitations for homesite development on the Roy soil are moderately slow permeability, slope, shrink-swell potential, potential frost action, content of rock fragments, and low soil strength. Slope is a concern in installing septic tank absorption fields. Absorption lines should be installed on the contour. The moderately slow permeability can be overcome by increasing the size of the absorption field. Frost action and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. Removal of pebbles and cobbles in disturbed areas is needed for best results when landscaping, particularly in areas used for lawns.

This map unit is in capability subclass VIIe, nonirrigated. The Roy soil is in Silty range site, 15- to 19-inch precipitation zone. The south-facing slopes of the Mocmont soil are in woodland suitability group 6o8 where slopes are 15 to 25 percent and group 6r6 where slopes are 25 to 45 percent. The north-facing slopes of the Mocmont soil are in woodland suitability group 5o2 where slopes are 15 to 25 percent and group 5r14 where slopes are 25 to 45 percent.

174—Neldore-Thebo clays, 4 to 25 percent slopes. This map unit is on uplands in the eastern and northeastern parts of the county. Slopes commonly are 250 to 1,000 feet long. Elevation is 2,200 to 3,800 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 44 degrees F, and the average frost-free period is about 130 days.

This unit is about 40 percent Neldore clay and 35 percent Thebo clay. The Neldore soil is on knolls and ridges, and the Thebo soil is on plane side slopes below and surrounding ridges.

Included in this unit are small areas of deep Pendroy soils, deep salt- and alkali-affected Marvan soils, and salt- and alkali-affected Absher and Nobe soils on foot slopes and fans. The Nobe soils have a crusty surface and support little if any vegetation. Included areas make up about 25 percent of the total acreage.

The Neldore soil is shallow and well drained. It formed in residuum derived dominantly from consolidated shale. Typically, the surface layer is grayish brown clay about 3 inches thick. The upper 9 inches of the underlying material is grayish brown clay, and the lower 6 inches is light gray clay. Gray shale is at a depth of 18 inches. Depth to shale ranges from 10 to 20 inches.

Permeability of the Neldore soil is slow. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. The average annual wetting depth where this soil is under native vegetation is 10 to 20 inches. Runoff is medium to rapid, and the hazard of water erosion is moderate to high. The hazard of soil blowing is high.

The Thebo soil is moderately deep and well drained. It formed in residuum derived dominantly from semiconsolidated shale. Typically, the surface layer is grayish brown clay about 5 inches thick. The underlying material is grayish brown clay about 28 inches thick. Gray shale is at a depth of 33 inches. Depth to shale ranges from 20 to 40 inches.

Permeability of the Thebo soil is very slow. Available water capacity is low to moderate. Effective rooting depth is 20 to 40 inches. The average annual wetting depth where this soil is under native vegetation is about 20 inches. Runoff is medium to rapid, and the hazard of water erosion is moderate to high. The hazard of soil blowing is high.

The soils in this unit are used as rangeland.

These soils are poorly suited to cultivated crops and to hay and pasture because of the hazards of soil blowing and water erosion and the shallow and moderate depth to shale.

The potential plant community on the Neldore soil is mainly western wheatgrass, plains reedgrass, plains muhly, and green needlegrass. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of fringed sagewort, plains reedgrass, blue grama, and wild rose increases. If excessive grazing continues, plants such as broom snakeweed, creeping juniper, perennial weeds, and annuals may invade. The potential plant community produces about 700 pounds of air-dry vegetation in years of above-normal precipitation and 300 pounds in years of below-normal precipitation.

The potential plant community on the Thebo soil is mainly western wheatgrass, green needlegrass, bluebunch wheatgrass, and thickspike wheatgrass. If the range is excessively grazed, the proportion of these plants decreases and the proportion of plains reedgrass, Sandberg bluegrass, prairie junegrass, and big sagebrush increases. If excessive grazing continues, plants such as perennial weeds, broom snakeweed, curlycup gumweed, and annual bromes may invade. The potential plant community produces about 1,400 pounds of air-dry vegetation in years of above-normal precipitation and 800 pounds in years of below-normal precipitation.

The surface layer of these soils is susceptible to water erosion and soil blowing if it is disturbed or if the range is overgrazed.

The Neldore soil is poorly suited to windbreaks. It is limited mainly by the very low available water capacity. The Thebo soil, where slopes are 15 to 25 percent, is poorly suited to windbreaks. It is limited mainly by slope.

Where slopes are 4 to 15 percent, the Thebo soil is suited to windbreaks. The low to moderate available water capacity limits the growth of both trees and shrubs. Suitable trees for planting are Russian-olive, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, western sandcherry, and skunkbush sumac. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings. Planting on the contour helps to conserve moisture.

The main limitations for homesite development on the soils in this unit are slow and very slow permeability, shallow and moderate depth to shale, shrink-swell potential, and low soil strength. The soils are severely limited for septic tank absorption fields because of the slow and very slow permeability and shallow and moderate depth to shale. Cuts to level building sites can expose shale. Shrinking and swelling and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential.

This map unit is in capability subclass VIe, nonirrigated. The Neldore soil is in Shallow Clay range site, 10- to 14-inch precipitation zone, and the Thebo soil is in Clayey range site, 10- to 14-inch precipitation zone.

175—Neldore-Thebo clays, 25 to 60 percent slopes. This map unit is on uplands in the eastern and northeastern parts of the county. Slopes commonly are 250 to 1,000 feet long. Elevation is 2,200 to 3,800 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 44 degrees F, and the average frost-free period is about 130 days.

This unit is about 60 percent Neldore clay and about 30 percent Thebo clay. The Neldore soil is on ridges and has slopes of 25 to 60 percent. The Thebo soil has slopes of 25 to 45 percent.

Included in this unit are small areas of deep, salt- and alkali-affected Gerdrum soils that are on foot slopes and fans and have slopes of 2 to 8 percent. Also included are small areas of shale outcrops on steep and very steep side slopes. Stones and boulders are on the surface in places. Included areas make up about 10 percent of the total acreage.

The Neldore soil is shallow and well drained. It formed in residuum derived dominantly from consolidated shale. Typically, the surface layer is grayish brown clay about 3 inches thick. The upper 9 inches of the underlying material is grayish brown clay, and the lower 6 inches is light gray clay. Gray shale is at a depth of about 18 inches. Depth to shale ranges from 10 to 20 inches.

Permeability of the Neldore soil is slow. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. The average annual wetting depth where this soil is under native vegetation is 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is high.

The Thebo soil is moderately deep and well drained. It formed in residuum derived dominantly from semiconsolidated shale. Typically, the surface layer is grayish brown clay about 5 inches thick. The underlying material is grayish brown clay about 28 inches thick. Gray shale is at a depth of about 33 inches. Depth to shale ranges from 20 to 40 inches.

Permeability of the Thebo soil is very slow. Available water capacity is low to moderate. Effective rooting depth is 20 to 40 inches. The average annual wetting depth where this soil is under native vegetation is about 20 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is high.

The soils in this unit are used as rangeland.

These soils are poorly suited to cultivated crops and to hay and pasture because of steepness of slope and rough topography.

The potential plant community on the Neldore soil is mainly western wheatgrass, plains reedgrass, plains muhly, and green needlegrass. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of fringed sagewort, plains reedgrass, blue grama, and wild rose increases. If excessive grazing continues, plants such as broom snakeweed, creeping juniper, perennial weeds, and annuals may invade. The potential plant community produces about 700 pounds of air-dry vegetation in years of above-normal precipitation and 300 pounds in years of below-normal precipitation.

The potential plant community on the Thebo soil is mainly western wheatgrass, green needlegrass, bluebunch wheatgrass, and thickspike wheatgrass. If the range is excessively grazed, the proportion of these plants decreases and the proportion of plains reedgrass, Sandberg bluegrass, prairie junegrass, and big sagebrush increases. If excessive grazing continues, plants such as perennial weeds, broom snakeweed, curlycup gumweed, and annual bromes may invade. The potential plant community produces about 1,400 pounds of air-dry vegetation in years of above-normal precipitation and 800 pounds in years of below-normal precipitation.

The surface layer of these soils is susceptible to water erosion and soil blowing if it is disturbed or if the range is overgrazed. The soils are not suited to mechanical treatment because of slope and rough topography.

These soils are not suited to windbreaks. They are limited mainly by slope.

The soils in this unit are poorly suited to homesite development because of the steepness of slope, the shallow depth to shale in the Neldore soil, and the moderate depth to shale in the Thebo soil.

This map unit is in capability subclass VIIe, nonirrigated. The Neldore soil is in Shallow Clay range site, 10- to 14-inch precipitation zone, and the Thebo soil is in the Clayey range site, 10- to 14-inch precipitation zone.

176—Neldore-Rock outcrop complex, 15 to 60 percent slopes. This map unit is on uplands in the eastern part of the county. Slopes commonly are 250 to 1,000 feet long. Elevation is 2,200 to 3,800 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 44 degrees F, and the average frost-free period is about 130 days.

This unit is about 45 percent Neldore clay and 35 percent Rock outcrop. The Neldore soil is on plane and convex side slopes, and Rock outcrop is on ridges, knolls, and very steep side slopes.

Included in this unit are small areas of moderately deep Thebo soils on uplands and deep Pendroy soils on fans. Included areas make up about 20 percent of the total acreage.

The Neldore soil is shallow and well drained. It formed in residuum derived dominantly from consolidated shale. Typically, the surface layer is grayish brown clay about 3 inches thick. The upper 9 inches of the underlying material is grayish brown clay. The lower part is light gray clay about 6 inches thick. Gray shale is at a depth of about 18 inches. Depth to shale ranges from 10 to 20 inches.

Permeability of the Neldore soil is slow. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. The average annual wetting depth where this soil is under native vegetation is 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is high.

Rock outcrop consists of exposures of platy shale. It is on steep and very steep side slopes and on ridges and knolls that are strongly sloping.

The soils in this unit are used as rangeland.

These soils are poorly suited to cultivated crops and to hay and pasture because of steepness of slope and rough topography.

The potential plant community on the Neldore soil is mainly western wheatgrass, plains reedgrass, plains muhly, and green needlegrass. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of fringed sagewort, plains reedgrass, blue grama, and wild rose increases. If excessive grazing continues, plants such as broom snakeweed, creeping juniper, perennial weeds, and annuals may invade. The potential plant community produces about 700 pounds of air-dry vegetation in years of above-normal precipitation and 300 pounds in years of below-normal precipitation.

The surface layer of the Neldore soil is susceptible to water erosion and soil blowing if it is disturbed or if the range is overgrazed. This soil is not suited to mechanical treatment because of slope and rough topography.

The Neldore soil is poorly suited to windbreaks. It is limited mainly by slope.

This unit is poorly suited to homesite development because of the steepness of slope, the shallow depth to shale in the Neldore soil, and the areas of Rock outcrop.

This map unit is in capability subclass VIIe, nonirrigated. The Neldore soil is in Shallow Clay range site, 10- to 14-inch precipitation zone.

177—Nesda Variant complex. This map unit is on low terraces and flood plains in the southern part of the county. Slope ranges from 0 to 2 percent. Slopes commonly are 250 to 1,000 feet long. Elevation is 4,700 to 6,500 feet. The average annual precipitation is about 22 inches, the average annual air temperature is about 40 degrees F, and the average frost-free period is about 70 days.

This unit is about 65 percent Nesda Variant very gravelly loam and about 15 percent Nesda Variant cobbly loam. About 60 percent of the acreage of these soils is forested.

Included in this unit are small areas of deep Adel, Hanson, and Raynesford soils on fans. Included areas make up about 20 percent of the total acreage.

The Nesda Variant very gravelly loam is deep and well drained. It formed in alluvium derived dominantly from limestone. Typically, the surface layer is very dark grayish brown very gravelly loam about 6 inches thick. The next layer is dark grayish brown extremely gravelly loam about 14 inches thick. The upper 12 inches of the underlying material is light brownish gray extremely gravelly coarse loamy sand, and the lower part to a depth of 60 inches or more is grayish brown extremely gravelly sandy loam.

The Nesda Variant cobbly loam is deep and well drained. It formed in alluvium derived dominantly from limestone. Typically, the surface layer is very dark grayish brown cobbly loam about 6 inches thick. The next layer is dark grayish brown extremely gravelly loam about 14 inches thick. The upper 12 inches of the underlying material is light brownish gray extremely gravelly coarse loamy sand, and the lower part to a depth of 60 inches or more is grayish brown extremely gravelly sandy loam.

Permeability of these soils is rapid. Available water capacity is very low. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight except during occasional floods. The hazard of soil blowing is moderate.

The soils in this unit are used for livestock grazing. They are also used as woodland.

These soils are poorly suited to cultivated crops and to hay and pasture because of many small stones in the surface layer and the cold climate.

The nonforested areas of these soils produce a potential plant community that is mainly bluebunch wheatgrass, Columbia needlegrass, rough fescue, and bearded wheatgrass. If the vegetation is excessively grazed, the proportion of these plants decreases and the proportion of Idaho fescue, western wheatgrass, prairie junegrass, and spikeoat increases. If excessive grazing continues, plants such as timothy, perennial forbs, and annuals may invade. The potential plant community produces about 2,200 pounds of air-dry vegetation in years of above-normal precipitation and 1,800 pounds in years of below-normal precipitation.

The potential native understory vegetation on the forested part of these soils is dominated by bearded wheatgrass, Columbia needlegrass, Oregon-grape, kinnikinnick, fireweed, shrubby cinquefoil, western wheatgrass, slender wheatgrass, and prairie junegrass. The understory provides large amounts of forage for livestock.

These soils are suited to the production of black cottonwood. The site index is about 25. At the culmination of the mean annual increment (CMAI), this soil can produce about 25 cubic feet, or 100 board feet (Scribner rule), of black cottonwood per acre per year. Potential production is estimated for an even-aged, fully stocked stand of trees.

The hazard of erosion is severe, equipment limitations are moderate, seedling mortality is moderate, plant competition is moderate, and the hazard of windthrow is slight.

The main limitations of these soils for management of timber are low available water capacity and the hazard of flooding. The low available water capacity and competition from understory plants adversely affect the establishment of cottonwood seedlings. Reducing plant competition insures adequate seedling survival.

The soils in this unit are poorly suited to homesite development because of the occasional flooding. The very gravelly or extremely gravelly material below a depth of about 14 inches is good road fill.

This map unit is in capability subclass VIw, nonirrigated. The Nesda Variant soils are in woodland suitability group 5w102.

178—Nesda-Sudworth complex, occasionally flooded. This map unit is on low terraces and flood plains in the central and western parts of the county. Slope ranges from 0 to 2 percent. Slopes commonly are 250 to 1,000 feet long. Elevation is 2,500 to 4,700 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 120 days.

This unit is about 45 percent Nesda gravelly loam and 40 percent Sudworth loam. The Nesda soil is in slightly convex areas, and the Sudworth soil is in plane areas.

Included in this unit are small areas of deep, well drained Straw soils and deep, somewhat poorly drained Enbar soils. The Enbar soils have a seasonal high water table at a depth of 30 to 60 inches. Included areas make up about 15 percent of the total acreage.

The Nesda soil is deep and well drained. It formed in alluvium derived from mixed rock sources. Typically, the surface layer is dark grayish brown gravelly loam about 6 inches thick. The next layer is grayish brown loam about 8 inches thick. The upper 2 inches of the underlying material is pale brown loamy sand, and the lower part to a depth of 60 inches or more is light brownish gray and grayish brown very gravelly sand.

Permeability of the Nesda soil is rapid. Available water capacity is very low to low. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is about 36 inches. Runoff is slow, and the hazard of water erosion is slight except during occasional periods of flooding. The hazard of soil blowing is moderate.

The Sudworth soil is deep and well drained. It formed in alluvium derived from mixed rock sources. Typically, the surface layer is dark grayish brown loam about 19 inches thick. The next layer is grayish brown loam about 8 inches thick. The underlying material to a depth of 66 inches or more is grayish brown extremely gravelly loamy sand.

Permeability of the Sudworth soil is moderate to a depth of 27 inches and rapid below this depth. Available water capacity is moderate. Effective rooting depth is 66 inches or more. The average annual wetting depth where this soil is under native vegetation is about 30 inches. Runoff is slow, and the hazard of water erosion is slight except during occasional floods. The hazard of soil blowing is high.

The soils in this unit are used mainly for livestock grazing. They are also used as woodland.

These soils are poorly suited to cultivated crops because of dissection by drainageways and the hazard of flooding.

The Nesda and Sudworth soils are forested. They are well suited to livestock grazing. The potential native understory vegetation on the Nesda soil is dominated by Woods rose, silverberry, common chokecherry, western wheatgrass, basin wildrye, redosier dogwood, silver buffaloberry, western snowberry, willow, and slender wheatgrass.

The potential native understory vegetation on the Sudworth soil is dominated by basin wildrye, western wheatgrass, western snowberry, common chokecherry, redosier dogwood, Woods rose, Columbia needlegrass, prairie junegrass, and willow. The understory provides moderate amounts of forage for livestock.

The Nesda and Sudworth soils are suited to the production of narrowleaf cottonwood. The site index is about 25 for the Nesda soil and 65 for the Sudworth soil. At the culmination of the mean annual increment (CMAI), the Nesda soil can produce about 25 cubic feet, or 100 board feet (Scribner rule), of narrowleaf cottonwood per acre per year, and the Sudworth soil can produce about 65 cubic feet, or 260 board feet (Scribner rule). Potential production is estimated for an even-aged, fully stocked stand of trees.

On the Nesda soil the hazard of erosion is moderate, equipment limitations are moderate, seedling mortality is severe, plant competition is moderate, and the hazard of windthrow is slight.

The main limitations of the Nesda soil for management of timber are very low to low available water capacity and the hazard of flooding. The low precipitation, low to very low available water capacity, and competition from understory plants adversely affect the establishment of cottonwood seedlings. Reducing plant competition insures adequate seedling survival.

On the Sudworth soil, the hazard of erosion is slight, equipment limitations are slight, seedling mortality is moderate, plant competition is moderate, and the hazard of windthrow is slight.

The Sudworth soil has low strength when wet, which results in poor trafficability and in soil compaction if heavy equipment is used to yard logs. Operating equipment when the soil is dry or frozen overcomes this limitation. The low precipitation and competition from understory plants adversely affect the establishment of cottonwood seedlings. Reducing plant competition insures adequate seedling survival.

The soils in this unit are poorly suited to homesite development because of the hazard of occasional flooding. The very gravelly or extremely gravelly material below a depth of about 14 inches is good road fill.

This map unit is in capability subclass VIw, nonirrigated. The Nesda soil is in woodland suitability group 5w100, and the Sudworth soil is in 3o100.

179—Norbert-Eltsac clays, 15 to 60 percent slopes. This map unit is on uplands in the central and western parts of the county. Slopes commonly are 250 to 1,000 feet long. Elevation is 3,500 to 4,500 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 120 days.

This unit is about 65 percent Norbert clay and 25 percent Eltsac clay. The Norbert soil is on the steeper side slopes and ridges, and the Eltsac soil is on plane side slopes below areas of Norbert soils.

Included in this unit are small areas of deep soils that formed in alluvium on foot slopes. Also included are small areas of Rock outcrop on ridge crests. Included areas make up about 10 percent of the total acreage.

The Norbert soil is shallow and well drained. It formed in residuum derived dominantly from semiconsolidated shale. Typically, the surface layer is olive gray clay about 3 inches thick. The upper 6 inches of the underlying material is olive gray clay, and the lower 5 inches is gray shaly clay. Gray shale is at a depth of about 14 inches. Depth to shale ranges from 10 to 20 inches.

Permeability of the Norbert soil is very slow. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. The average annual wetting depth where this soil is under native vegetation is 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is high.

The Eltsac soil is moderately deep and well drained. It formed in residuum derived dominantly from semiconsolidated shale. Typically, the surface layer is dark grayish brown clay about 4 inches thick. The upper 17 inches of the underlying material is grayish brown clay, the next 8 inches is grayish brown and gray clay, and the lower 9 inches is dark gray and yellowish brown clay and shale fragments. Dark gray shale is at a depth of about 38 inches. Depth to shale ranges from 20 to 40 inches.

Permeability of the Eltsac soil is very slow. Available water capacity is very low to low. Effective rooting depth is 20 to 40 inches. The average annual wetting depth where this soil is under native vegetation is 20 to 24 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is high.

The soils in this unit are used as rangeland.

These soils are poorly suited to cultivated crops and to hay and pasture because of steepness of slope and rough topography.

The potential plant community on the Norbert soil is mainly bluebunch wheatgrass, western wheatgrass, green needlegrass, and big sagebrush. If the range is excessively grazed, the proportion of these plants decreases and the proportion of plains reedgrass, Sandberg bluegrass, prairie junegrass, and fringed sagewort increases. If excessive grazing continues, plants such as broom snakeweed, pricklypear, perennial weeds, and annuals may invade. The potential plant community produces about 1,100 pounds of air-dry vegetation in years of above-normal precipitation and 600 pounds in years of below-normal precipitation.

The potential plant community on the Eltsac soil is mainly rough fescue, bluebunch wheatgrass, green needlegrass, and western wheatgrass. If the range is excessively grazed, the proportion of these plants decreases and the proportion of Idaho fescue, plains reedgrass, blue grama, and Sandberg bluegrass increases. If excessive grazing continues, plants such as timothy, clubmoss, perennial weeds, and annuals may invade. The potential plant community produces about 2,300 pounds of air-dry vegetation in years of above-normal precipitation and 1,800 pounds in years of below-normal precipitation.

The surface layer of these soils is susceptible to water erosion and soil blowing if it is disturbed or if the range is overgrazed. The soils are not suited to mechanical treatment because of slope and rough topography.

These soils are poorly suited to windbreaks. They are limited mainly by slope.

The soils in this unit are poorly suited to homesite development because of the steepness of slope, the shallow depth to shale in the Norbert soil, and the moderate depth to shale in the Eltsac soil.

This map unit is in capability subclass VIIe, nonirrigated. The Norbert soil is in Shallow Clay range site, 15- to 19-inch precipitation zone, and the Eltsac soil is in Clayey range site, 15- to 19-inch precipitation zone.

180—Pekay silty clay, 0 to 2 percent slopes. This deep, well drained soil is on terraces in the southern part of the county. It formed in alluvium derived dominantly from shale. Slopes commonly are more than 1,000 feet long. Elevation is 4,100 to 4,700 feet. The average annual precipitation is about 20 inches, the average annual air temperature is about 42 degrees F, and the average frost-free period is about 100 days.

Included in this unit are small areas of Pekay soils that have slopes of 2 to 4 percent.

Typically, the surface layer of this Pekay soil is very dark gray silty clay about 7 inches thick. The upper 40 inches of the subsoil is dark gray silty clay and clay, and the lower 13 inches is gray silty clay. The substratum to a depth of 66 inches or more is gray silty clay.

Permeability is slow. Available water capacity is high. Effective rooting depth is 66 inches or more. The average annual wetting depth where this soil is under native vegetation is 66 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high; however, the valley location of this soil provides protection.

This soil is used for nonirrigated crops, mainly wheat, barley, oats, alfalfa, and grass for hay and pasture. It is also used as rangeland.

This soil is well suited to nonirrigated crops. It is limited mainly by the short growing season and the hazard of soil blowing. Soil blowing can be reduced by returning crop residue to the soil, practicing minimum tillage, and growing sod crops such as hay and pasture. Returning crop residue to the soil also helps to maintain good tilth.

The potential plant community on this soil is mainly western wheatgrass, bluebunch wheatgrass, green needlegrass, and rough fescue. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of Idaho fescue, western wheatgrass, plains reedgrass, and Sandberg bluegrass increases. If excessive grazing continues, plants such as broom snakeweed, Kentucky bluegrass, perennial weeds, and annuals may invade. The potential plant community produces about 2,700 pounds of air-dry vegetation in years of above-normal precipitation and 2,200 pounds in years of below-normal precipitation.

This soil is suitable for seeding to adapted grasses and forbs if the range is in poor condition. The surface layer is susceptible to soil blowing if it is disturbed or if the range is overgrazed.

This soil is well suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian crabapple, green ash, Siberian elm, white willow, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and cotoneaster. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings.

The main limitations for homesite development on this soil are slow permeability, shrink-swell potential, potential frost action, and low soil strength. If the soil is used for septic tank absorption fields, the slow permeability can be overcome by increasing the size of the absorption field. Shrinking and swelling, frost action, and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential.

This map unit is in capability subclass IIIe, nonirrigated, and in Clayey range site, 15- to 19-inch precipitation zone.

181—Pekay silty clay, 2 to 8 percent slopes. This deep, well drained soil is on terraces and fans in the southern part of the county. It formed in alluvium derived dominantly from shale. Slopes commonly are 250 to 1,000 feet long. Elevation is 4,100 to 4,700 feet. The average annual precipitation is about 20 inches, the average annual air temperature is about 42 degrees F, and the average frost-free period is about 100 days.

Included in this unit are small areas of Pekay soils that have slopes of 0 to 2 percent and slopes of 8 to 12 percent.

Typically, the surface layer of this Pekay soil is very dark gray silty clay about 7 inches thick. The upper 40 inches of the subsoil is dark gray silty clay and clay, and the lower 13 inches is gray silty clay. The substratum to a depth of 66 inches or more is gray silty clay.

Permeability is slow. Available water capacity is high. Effective rooting depth is 66 inches or more. The average annual wetting depth where this soil is under native vegetation is 66 inches or more. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high; however, the valley location of this soil provides protection.

This soil is used for nonirrigated crops, mainly wheat, barley, oats, alfalfa, and grass for hay and pasture. It is also used as rangeland.

This soil is well suited to nonirrigated crops. It is limited mainly by the short growing season and the hazards of water erosion and soil blowing. Minimum tillage, contour cultivation, grassed waterways, stubble-mulch tillage, and growing sod crops such as hay and pasture help to control soil blowing and water erosion. Returning crop residue to the soil helps to maintain good tilth and to control soil blowing.

The potential plant community on this soil is mainly western wheatgrass, bluebunch wheatgrass, green needlegrass, and rough fescue. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of Idaho fescue, western wheatgrass, plains reedgrass, and Sandberg bluegrass increases. If excessive grazing continues, plants such as broom snakeweed, Kentucky bluegrass, perennial weeds, and annuals may invade. The potential plant community produces about 2,700 pounds of air-dry vegetation in years of above-normal precipitation and 2,200 pounds in years of below-normal precipitation.

This soil is suitable for seeding to adapted grasses and forbs if the range is in poor condition. Seedbed preparation and planting on the contour or across the slope, where practical, conserve moisture and help to control water erosion. The surface layer is susceptible to water erosion and soil blowing if it is disturbed or if the range is overgrazed.

This soil is well suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian crabapple, green ash, Siberian elm, white willow, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and cotoneaster. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings.

The main limitations for homesite development on this soil are slow permeability, shrink-swell potential, potential frost action, and low soil strength. If the soil is used for septic tank absorption fields, the slow permeability can be overcome by increasing the size of the absorption field. Shrinking and swelling, frost action, and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential.

This map unit is in capability subclass IIIe, nonirrigated, and in Clayey range site, 15- to 19-inch precipitation zone.

182—Pendroy clay, 0 to 4 percent slopes. This deep, well drained soil is on terraces and fans in the northeastern part of the county. It formed in alluvium derived dominantly from shale. Slopes commonly are 250 to 1,000 feet long. Elevation is 2,600 to 3,400 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 44 degrees F, and the average frost-free period is about 130 days.

Included in this unit are small areas of moderately deep Thebo soils on uplands and deep, salt- and alkali-affected Gerdrum and Absher soils in nearly level areas. The Absher soils have a thin, crusty surface layer and are nearly barren of vegetation.

Typically, the surface layer is grayish brown clay about 3 inches thick. The next layer is grayish brown clay about 6 inches thick. The underlying material to a depth of 60 inches or more is grayish brown and light brownish gray clay.

Permeability of this Pendroy soil is very slow. Available water capacity is high. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is about 20 inches. Runoff is medium, and the hazard of water erosion is slight to moderate. The hazard of soil blowing is high.

This soil is used mainly as rangeland. It is also used for hay and pasture and for nonirrigated crops such as wheat, barley, and oats.

This soil is suited to nonirrigated crops. It is limited mainly by low precipitation, clayey texture, and the hazards of soil blowing and water erosion. Because precipitation is not sufficient for annual cropping, a cropping system that includes small grains and summer fallow is best. Minimum tillage, contour cultivation, stripcropping, tall grass barriers, grassed waterways, return of crop residue to the soil, and growing sod crops such as hay and pasture help to control soil blowing and water erosion. Tall grass barriers also reduce evaporation and trap snow, which increases the amount of moisture in the soil. Returning crop residue to the soil also helps to maintain good tilth. Chiseling through stubble in fall on the contour or across the slope helps to control water erosion.

The potential plant community on this soil is mainly western wheatgrass, green needlegrass, bluebunch wheatgrass, and thickspike wheatgrass. If the range is excessively grazed, the proportion of these plants decreases and the proportion of plains reedgrass, Sandberg bluegrass, prairie junegrass, and big sagebrush increases. If excessive grazing continues, plants such as perennial weeds, broom snakeweed, curlycup gumweed, and annual bromes may invade. The potential plant community produces about 1,200 pounds of air-dry vegetation in years of above-normal precipitation and 700 pounds in years of below-normal precipitation.

This soil is suitable for seeding to adapted grasses and forbs if the range is in poor condition. Seedbed

preparation and planting on the contour or across the slope, where practical, conserve moisture and help to control water erosion. The surface layer is susceptible to water erosion and soil blowing if it is disturbed or if the range is overgrazed.

This soil is suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian crabapple, green ash, Siberian elm, white willow, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and cotoneaster. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings. Planting on the contour helps to conserve moisture.

The main limitations for homesite development on this soil are very slow permeability, shrink-swell potential, and low soil strength. If the soil is used for septic tank absorption fields, the very slow permeability can be overcome by increasing the size of the absorption field. Shrinking and swelling and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential.

This map unit is in capability subclass IVs, nonirrigated, and in Clayey range site, 10- to 14-inch precipitation zone.

183—Pits, gravel. This map unit consists of open excavations from which soil material and gravel have been removed. It is on terraces and edges of terraces throughout the county.

This unit provides limited forage for livestock and wildlife and provides some protection for wildlife.

This map unit is in capability class VIII.

184—Raynesford-Hanson complex, 0 to 4 percent slopes. This map unit is on terraces and fans in the southern part of the county. Slopes commonly are 250 to 1,000 feet long. Elevation is 4,600 to 6,000 feet. The average annual precipitation is about 22 inches, the average annual air temperature is about 40 degrees F, and the average frost-free period is about 70 days.

This unit is about 50 percent Raynesford loam and about 30 percent Hanson gravelly loam. The Raynesford soil is on plane side slopes, and the Hanson soil is in convex areas.

Included in this unit are small concave areas of deep Bridger soils and small convex areas of Hanson cobbly loam.

The Raynesford soil is deep and well drained. It formed in alluvium derived dominantly from limestone. Typically, the surface layer is dark gray loam about 8 inches thick. The next layer is grayish brown clay loam about 4 inches thick. The upper 7 inches of the underlying material is light brownish gray clay loam, the next 4 inches is light brownish gray gravelly loam, and the lower part is pale yellow loam about 19 inches thick. Below this to a depth of 60 inches or more is light brownish gray very gravelly clay loam.

Permeability of the Raynesford soil is moderately slow. Available water capacity is moderate. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

The Hanson soil is deep and well drained. It formed in alluvium derived dominantly from limestone. Typically, the surface layer is very dark grayish brown gravelly loam about 11 inches thick. The next layer is dark grayish brown cobbly clay loam about 4 inches thick. The underlying material to a depth of 62 inches or more is pale brown and very pale brown extremely gravelly clay loam.

Permeability of the Hanson soil is moderate. Available water capacity is moderate. Effective rooting depth is 62 inches or more. The average annual wetting depth where this soil is under native vegetation is 62 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

The soils in this unit are used mainly for hay and pasture and as rangeland. They are also used for nonirrigated crops such as wheat, barley, and oats.

These soils are suited to nonirrigated crops. They are limited mainly by the short growing season, the hazard of soil blowing, and the moderate available water capacity. Timeliness is of prime importance in all tillage, seeding, and harvesting operations. Soil blowing can be reduced by returning crop residue to the soil, practicing minimum tillage, and growing sod crops such as hay and pasture.

The potential plant community on these soils is mainly rough fescue, bluebunch wheatgrass, Columbia needlegrass, and mountain brome. If the range is excessively grazed, the proportion of these plants decreases and the proportion of Idaho fescue, western wheatgrass, Letterman needlegrass, and spikeoat increases. If excessive grazing continues, plants such as timothy, Kentucky bluegrass, onespike danthonia, and perennial forbs may invade. The potential plant community produces about 3,400 pounds of air-dry vegetation in years of above-normal precipitation and 2,500 pounds in years of below-normal precipitation.

These soils are suitable for seeding to adapted grasses and forbs if the range is in poor condition. The surface layer is susceptible to soil blowing if it is disturbed or if the range is overgrazed.

These soils are suited to windbreaks, but the high concentration of lime at a depth of less than 15 inches and the limited moisture supply restrict the choice of trees and shrubs. Suitable trees for planting are Russian-olive, Siberian elm, ponderosa pine, and Rocky Mountain

juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, and skunkbush sumac. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings.

The main limitations for homesite development on the soils in this unit are potential frost action, content of rock fragments, low soil strength, and the moderately slow permeability of the Raynesford soil. If the Raynesford soil is used for septic tank absorption fields, the moderately slow permeability can be overcome by increasing the size of the absorption field. Frost action and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. The very gravelly or extremely gravelly material below a depth of about 15 inches is good road fill. Removal of pebbles and cobbles in disturbed areas is needed for best results when landscaping, particularly in areas used for lawns.

This map unit is in capability subclass IVe, nonirrigated, and in Silty range site, 20- to 24-inch precipitation zone.

185—Raynesford-Hanson complex, 4 to 15 percent slopes. This map unit is on terraces and fans in the southern part of the county. Slopes commonly are 250 to 1,000 feet long. Elevation is 4,600 to 6,000 feet. The average annual precipitation is about 22 inches, the average annual air temperature is about 40 degrees F, and the average frost-free period is about 70 days.

This unit is about 40 percent Raynesford loam and about 30 percent Hanson gravelly loam. The Raynesford soil is on plane side slopes, and the Hanson soil is in convex areas.

Included in this unit are small areas of deep Bridger soils on concave side slopes and soils that have slopes of less than 4 percent.

The Raynesford soil is deep and well drained. It formed in alluvium derived dominantly from limestone. Typically, the surface layer is dark gray loam about 8 inches thick. The next layer is grayish brown clay loam about 4 inches thick. The upper 7 inches of the underlying material is light brownish gray clay loam, the next 4 inches is light brownish gray gravelly loam, and the lower 19 inches is pale yellow loam. Below this to a depth of 60 inches or more is light brownish gray very gravelly clay loam.

Permeability of the Raynesford soil is moderately slow. Available water capacity is moderate. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is 60 inches or more. Runoff is medium, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

The Hanson soil is deep and well drained. It formed in alluvium derived dominantly from limestone. Typically, the surface layer is very dark grayish brown gravelly loam about 11 inches thick. The next layer is dark grayish brown cobbly clay loam about 4 inches thick. The underlying material to a depth of 62 inches or more is pale brown and very pale brown extremely gravelly clay loam.

Permeability of the Hanson soil is moderate. Available water capacity is moderate. Effective rooting depth is 62 inches or more. The average annual wetting depth where this soil is under native vegetation is 62 inches or more. Runoff is medium, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

The soils in this unit are used mainly for hay and pasture and as rangeland. They are also used for nonirrigated crops such as wheat, barley, and oats.

These soils are suited to nonirrigated crops. They are limited mainly by the hazards of water erosion and soil blowing, the short growing season, and the moderate available water capacity. Timeliness is of prime importance in all tillage, seeding, and harvesting operations. Minimum tillage, contour cultivation, grassed waterways, stubble-mulch tillage, and growing sod crops such as hay and pasture help to control soil blowing and water erosion.

The potential plant community on these soils is mainly rough fescue, bluebunch wheatgrass, Columbia needlegrass, and mountain brome. If the range is excessively grazed, the proportion of these plants decreases and the proportion of Idaho fescue, western wheatgrass, Letterman needlegrass, and spikeoat increases. If excessive grazing continues, plants such as timothy, Kentucky bluegrass, onespike danthonia, and perennial forbs may invade. The potential plant community produces about 3,400 pounds of air-dry vegetation in years of above-normal precipitation and 2,500 pounds in years of below-normal precipitation.

These soils are suitable for seeding to adapted grasses and forbs if the range is in poor condition. Seedbed preparation and planting on the contour or across the slope, where practical, conserve moisture and help to control water erosion. The surface layer is susceptible to water erosion and soil blowing if it is disturbed or if the range is overgrazed.

These soils are suited to windbreaks, but the high concentration of lime at a depth of less than 15 inches and the limited moisture supply restrict the choice of trees and shrubs. Suitable trees for planting are Russian-olive, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, and skunkbush sumac. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings. Planting on the contour helps to conserve moisture.

The main limitations for homesite development on the soils in this unit are potential frost action, content of rock fragments, low soil strength, slope, and the moderately

slow permeability of the Raynesford soil. If the Raynesford soil is used for septic tank absorption fields, the moderately slow permeability can be overcome by increasing the size of the absorption field. Slope is a concern in installing septic tank absorption fields. Absorption lines should be installed on the contour. Frost action and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. Removal of pebbles and cobbles in disturbed areas is needed for best results when landscaping, particularly in areas used for lawns. The very gravelly or extremely gravelly material below a depth of about 15 inches is good road fill.

This map unit is in capability subclass IVe, nonirrigated, and in Silty range site, 20- to 24-inch precipitation zone.

186—Reeder loam, 2 to 8 percent slopes. This moderately deep, well drained soil is on uplands in the northwestern part of the county. It formed in residuum derived dominantly from weakly consolidated, sandy and silty sedimentary beds. Slopes commonly are 250 to 1,000 feet long. Elevation is 3,400 to 3,800 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 120 days.

Included in this unit are small areas of moderately deep Amor soils on convex side slopes and deep Farnuf soils on fans and in swales.

Typically, the surface layer of this Reeder soil is dark grayish brown loam about 7 inches thick. The upper 8 inches of the subsoil is brown and grayish brown silty clay loam, and the lower 5 inches is grayish brown silt loam. The upper 7 inches of the substratum is grayish brown silt loam, and the lower 12 inches is grayish brown loam. Light yellowish brown sedimentary beds are at a depth of about 39 inches. Depth to sedimentary beds ranges from 20 to 40 inches.

Permeability is moderate. Available water capacity is moderate. Effective rooting depth is 20 to 40 inches. The average annual wetting depth where this soil is under native vegetation is 20 to 30 inches. Runoff is slow to medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

This soil is used for nonirrigated crops, mainly wheat, barley, oats, alfalfa, and grass for hay and pasture. It is also used as rangeland.

This soil is well suited to nonirrigated crops. It is limited mainly by the moderate available water capacity, low precipitation, and the hazards of soil blowing and water erosion. Minimum tillage, contour cultivation, grassed waterways, stripcropping, and growing sod crops such as hay and pasture help to control soil blowing and water erosion.

The potential plant community on this soil is mainly bluebunch wheatgrass, green needlegrass, western wheatgrass, and needleandthread. If the range is excessively grazed, the proportion of some of these plants decreases and the proportion of western wheatgrass, needleandthread, Sandberg bluegrass, and blue grama increases. If excessive grazing continues, plants such as Kentucky bluegrass, timothy, clubmoss, and perennial weeds may invade. The potential plant community produces about 2,000 pounds of air-dry vegetation in years of above-normal precipitation and 1,200 pounds in years of below-normal precipitation.

Where clubmoss and blue grama are the dominant vegetation on this soil, pitting, furrowing, chiseling, or other mechanical treatment practices can be used to improve depleted rangeland. This soil is suitable for seeding to adapted grasses and forbs if the range is in poor condition. Seedbed preparation and planting on the contour or across the slope, where practical, conserve moisture and help to control water erosion. The surface layer is susceptible to water erosion and soil blowing if it is disturbed or if the range is overgrazed.

This soil is well suited to windbreaks. The moderate available water capacity limits the growth of both trees and shrubs. Suitable trees for planting are Russian-olive, Siberian crabapple, green ash, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and cotoneaster. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings. Planting on the contour helps to conserve moisture.

The main limitations for homesite development on this soil are moderate depth to sedimentary beds, shrink-swell potential, potential frost action, and low soil strength. If the soil is used for septic tank absorption fields, the slow permeability of the underlying sedimentary beds can be overcome by increasing the size of the absorption field or by excavating the trench to a suitable depth. The field or trench should be backfilled with gravel. Shrinking and swelling, frost action, and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential.

This map unit is in capability subclass IIIe, nonirrigated, and in Silty range site, 15- to 19-inch precipitation zone.

187—Regent silty clay loam, 2 to 8 percent slopes. This moderately deep, well drained soil is on uplands in the northwestern part of the county. It formed in residuum derived dominantly from semiconsolidated shale. Slopes commonly are 250 to 1,000 feet long. Elevation is 3,400 to 4,500 feet. The average annual precipitation is about 16 inches, the average annual air

temperature is about 43 degrees F, and the average frost-free period is about 120 days.

Included in this unit are small areas of shallow Wayden soils on ridges and knolls and small areas of Regent soils that have slopes of 8 to 12 percent.

Typically, the surface layer of this Regent soil is dark grayish brown silty clay loam about 6 inches thick. The upper 7 inches of the subsoil is brown silty clay, and the lower 16 inches is grayish brown silty clay loam. The substratum is light brownish gray silty clay loam about 6 inches thick. Light brownish gray shale is at a depth of about 35 inches. Depth to shale ranges from 20 to 40 inches.

Permeability is slow. Available water capacity is moderate. Effective rooting depth is 20 to 40 inches. The average annual wetting depth where this soil is under native vegetation is 20 to 26 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is slight.

This soil is used for nonirrigated crops, mainly wheat, barley, oats, alfalfa, and grass for hay and pasture. It is also used as rangeland.

This soil is well suited to nonirrigated crops. It is limited mainly by the moderate available water capacity, low precipitation, and the hazard of water erosion. Minimum tillage, contour cultivation, grassed waterways, stubble-mulch tillage, and growing sod crops such as hay and pasture help to control water erosion.

The potential plant community on this soil is mainly bluebunch wheatgrass, green needlegrass, western wheatgrass, and Idaho fescue. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of Idaho fescue, plains reedgrass, Sandberg bluegrass, and blue grama increases. If excessive grazing continues, plants such as broom snakeweed, Kentucky bluegrass, perennial weeds, and annuals may invade. The potential plant community produces about 2,300 pounds of air-dry vegetation in years of above-normal precipitation and 1,700 pounds in years of below-normal precipitation.

This soil is suitable for seeding to adapted grasses and forbs if the range is in poor condition. Seedbed preparation and planting on the contour or across the slope, where practical, conserve moisture and help to control water erosion. The surface layer is susceptible to water erosion if it is disturbed or if the range is overgrazed.

This soil is well suited to windbreaks, but the moderate available water capacity limits the growth of both trees and shrubs. Suitable trees for planting are Russian-olive, Siberian crabapple, green ash, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and cotoneaster. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings. Planting on the contour helps to conserve moisture.

The main limitations for homesite development on this soil are slow permeability, moderate depth to shale, shrink-swell potential, and low soil strength. The soil is severely limited for septic tank absorption fields because of the slow permeability and moderate depth to shale. Cuts to level building sites can expose shale. Shrinking and swelling and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling with suitable material that has low shrink-swell potential.

This map unit is in capability subclass IIIe, nonirrigated, and in Clayey range site, 15- to 19-inch precipitation zone.

188—Regent silty clay, 2 to 8 percent slopes. This moderately deep, well drained soil is on uplands in the western and central parts of the county. It formed in residuum derived dominantly from semiconsolidated shale. Slopes commonly are 250 to 1,000 feet long. Elevation is 3,400 to 4,500 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 120 days.

Included in this unit are small areas of soils that have slopes of 8 to 12 percent. Also included are small areas of moderately deep Winifred soils on convex side slopes.

Typically, the surface layer of this Regent soil is dark grayish brown silty clay about 6 inches thick. The upper 7 inches of the subsoil is brown silty clay, and the lower 16 inches is grayish brown silty clay loam. The substratum is light brownish gray silty clay loam about 6 inches thick. Light brownish gray shale is at a depth of about 35 inches. Depth to shale ranges from 20 to 40 inches.

Permeability is slow. Available water capacity is moderate. Effective rooting depth is 20 to 40 inches. The average annual wetting depth where this soil is under native vegetation is 20 to 26 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high.

This soil is used for nonirrigated crops, mainly wheat, barley, oats, alfalfa, and grass for hay and pasture. It is also used as rangeland.

This soil is well suited to nonirrigated crops. It is limited mainly by the moderate available water capacity, low precipitation, and the hazards of soil blowing and water erosion. Minimum tillage, contour cultivation, grassed waterways, stripcropping, and growing sod crops such as hay and pasture help to control soil blowing and water erosion. Returning crop residue to the soil helps to maintain good tilth and a desirable water intake rate.

The potential plant community on this soil is mainly bluebunch wheatgrass, green needlegrass, western wheatgrass, and Idaho fescue. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of Idaho fescue, plains reedgrass, Sandberg bluegrass, and blue grama increases. If excessive grazing continues, plants such as broom snakeweed, Kentucky bluegrass, perennial weeds, and annuals may invade. The potential plant community produces about 2,300 pounds of air-dry vegetation in years of above-normal precipitation and 1,700 pounds in years of below-normal precipitation.

This soil is suitable for seeding to adapted grasses and forbs if the range is in poor condition. Seedbed preparation and planting on the contour or across the slope, where practical, conserve moisture and help to control water erosion. The surface layer is susceptible to water erosion and soil blowing if it is disturbed or if the range is overgrazed.

This soil is well suited to windbreaks, but the moderate available water capacity limits the growth of both trees and shrubs. Suitable trees for planting are Russian-olive, Siberian crabapple, green ash, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and cotoneaster. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings. Planting on the contour helps to conserve moisture.

The main limitations for homesite development on this soil are slow permeability, moderate depth to shale, shrink-swell potential, and low soil strength. The soil is severely limited for septic tank absorption fields because of the slow permeability and moderate depth to shale. Cuts to level building sites can expose shale. Shrinking and swelling and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential.

This map unit is in capability subclass IIIe, nonirrigated, and in Clayey range site, 15- to 19-inch precipitation zone.

189—Richey silty clay loam, 0 to 2 percent slopes. This deep, well drained soil is on terraces and fans in the eastern part of the county. It formed in alluvium. Slopes commonly are more than 1,000 feet long. Elevation is 2,200 to 3,500 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 44 degrees F, and the average frost-free period is about 130 days.

Typically, the surface layer of this Richey soil is grayish brown silty clay loam about 7 inches thick. The subsoil is grayish brown and light brownish gray silty clay loam about 22 inches thick. The upper 16 inches of the substratum is light brownish gray silty clay, and the lower part to a depth of 66 inches or more is light brownish gray silty clay loam.

Included in this unit are small, convex areas of deep Kobar soils and small areas of Rickey soils that have slopes of 2 to 4 percent.

Permeability is slow. Available water capacity is high. Effective rooting depth is 66 inches or more. The average annual wetting depth where this soil is under native vegetation is about 22 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

This soil is used for nonirrigated crops, mainly wheat, barley, and oats. It is also used for hay and pasture and as rangeland.

This soil is well suited to nonirrigated crops. It is limited mainly by low precipitation and the hazard of soil blowing. Suitable practices for controlling soil blowing are stripcropping, tall grass barriers, field windbreaks, minimum tillage, stubble-mulch tillage, and growing sod crops such as hay and pasture.

The potential plant community on this soil is mainly western wheatgrass, green needlegrass, bluebunch wheatgrass, and thickspike wheatgrass. If the range is excessively grazed, the proportion of these plants decreases and the proportion of plains reedgrass, blue grama, Sandberg bluegrass, and fringed sagewort increases. If excessive grazing continues, plants such as perennial weeds, broom snakeweed, annuals, and clubmoss may invade. The potential plant community produces about 1,500 pounds of air-dry vegetation in years of above-normal precipitation and 900 pounds in years of below-normal precipitation.

This soil is suitable for seeding to adapted grasses and forbs if the range is in poor condition. The surface layer is susceptible to soil blowing if it is disturbed or if the range is overgrazed.

This soil is well suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian crabapple, green ash, Siberian elm, white willow, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and cotoneaster. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings.

The main limitations for homesite development on this soil are slow permeability, shrink-swell potential, potential frost action, and low soil strength. If the soil is used for septic tank absorption fields, the slow permeability can be overcome by increasing the size of the absorption field. Shrinking and swelling, frost action, and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these

limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential.

This map unit is in capability subclass IIIe, nonirrigated, and in Clayey range site, 10- to 14-inch precipitation zone.

190—Rock outcrop. This map unit consists of nearly barren outcroppings of rock, mainly shale, on steep to very steep side slopes along some of the deeply entrenched drainageways in the northern part of the county. It is along the Missouri River and its tributaries.

Included in this unit are areas of shallow, clayey soils on uplands and deep, clayey soils on foot slopes. These areas make up less than 15 percent of the unit. The included areas have some value as wildlife habitat.

This unit provides almost no forage for livestock. It provides some protection for livestock and wildlife, and some areas have esthetic value.

This map unit is in capability class VIII.

191—Rock outcrop-Rubble land association. This map unit is mainly in the Big Snowy Mountains in the southern part of the county. It consists of exposures of limestone Rock outcrop on mountaintops and mountainsides and of Rubble land below the Rock outcrop. Rubble land consists of land covered by rocks that have tumbled from above. A trace of soil material is at the base of the rubble.

This unit is not suited to livestock grazing. Some areas provide some protection for wildlife. The unit has some esthetic value.

This map unit is in capability class VIII.

192—Roy gravelly clay loam, 0 to 2 percent slopes. This deep, well drained soil is on terraces and fans in the central part of the county. It formed in alluvium derived from mixed rock sources. Slopes commonly are more than 1,000 feet long. Elevation is 3,400 to 4,700 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 120 days.

Included in this unit are small areas of Roy cobbly clay loam, Roy clay loam, deep Tamaneen soils, and deep, salt- and alkali-affected Adger soils.

Typically, the surface layer of this Roy soil is dark grayish brown gravelly clay loam about 7 inches thick. The subsoil is brown and grayish brown very cobbly clay loam about 17 inches thick. The substratum to a depth of 60 inches or more is light brownish gray and grayish brown extremely cobbly clay loam.

Permeability is moderately slow. Available water capacity is low. Effective rooting depth is 60 inches or more. The average annual wetting depth where this soil is under native vegetation is about 26 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

This soil is used for nonirrigated crops, mainly wheat, barley, oats, alfalfa, and grass for hay and pasture. It is also used as rangeland.

This soil is well suited to nonirrigated crops. It is limited mainly by the low available water capacity, limited precipitation, and the hazard of soil blowing. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, stubble mulch tillage, and growing sod crops such as hay and pasture help to control soil blowing.

The potential plant community on this soil is mainly bluebunch wheatgrass, green needlegrass, rough fescue, and western wheatgrass. If the range is excessively grazed, the proportion of most of these plants decreases and the proportion of Idaho fescue, needleandthread, western wheatgrass, and blue grama increases. If excessive grazing continues, plants such as timothy, Kentucky bluegrass, clubmoss, and perennial weeds may invade. The potential plant community produces about 2,400 pounds of air-dry vegetation in years of above-normal precipitation and 1,500 pounds in years of below-normal precipitation.

This soil is suitable for seeding to adapted grasses and forbs if the range is in poor condition. The surface layer is susceptible to soil blowing if it is disturbed or if the range is overgrazed.

The Roy soil is suited to windbreaks, but the low available water capacity limits the growth of both trees and shrubs. Suitable trees for planting are Russian-olive, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, western sandcherry, and skunkbush sumac. Summer fallow, cultivation for weed control, and adapted plants are needed to insure establishment and survival of seedlings.

The main limitations for homesite development on this soil are moderately slow permeability, shrink-swell potential, potential frost action, and low soil strength. If the soil is used for septic tank absorption fields, the moderately slow permeability can be overcome by increasing the size of the absorption field. Shrinking and swelling, frost action, and low soil strength can damage roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In the construction of basements or foundations for dwellings, the shrink-swell potential can be overcome by backfilling excavations with suitable material that has low shrink-swell potential.

This map unit is in capability subclass IIIs, nonirrigated, and in Silty range site, 15- to 19-inch precipitation zone.

193—Roy gravelly clay loam, 2 to 8 percent slopes. This deep, well drained soil is on fans and terraces in the central part of the county. It formed in alluvium derived from mixed rock sources. Slopes commonly are

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