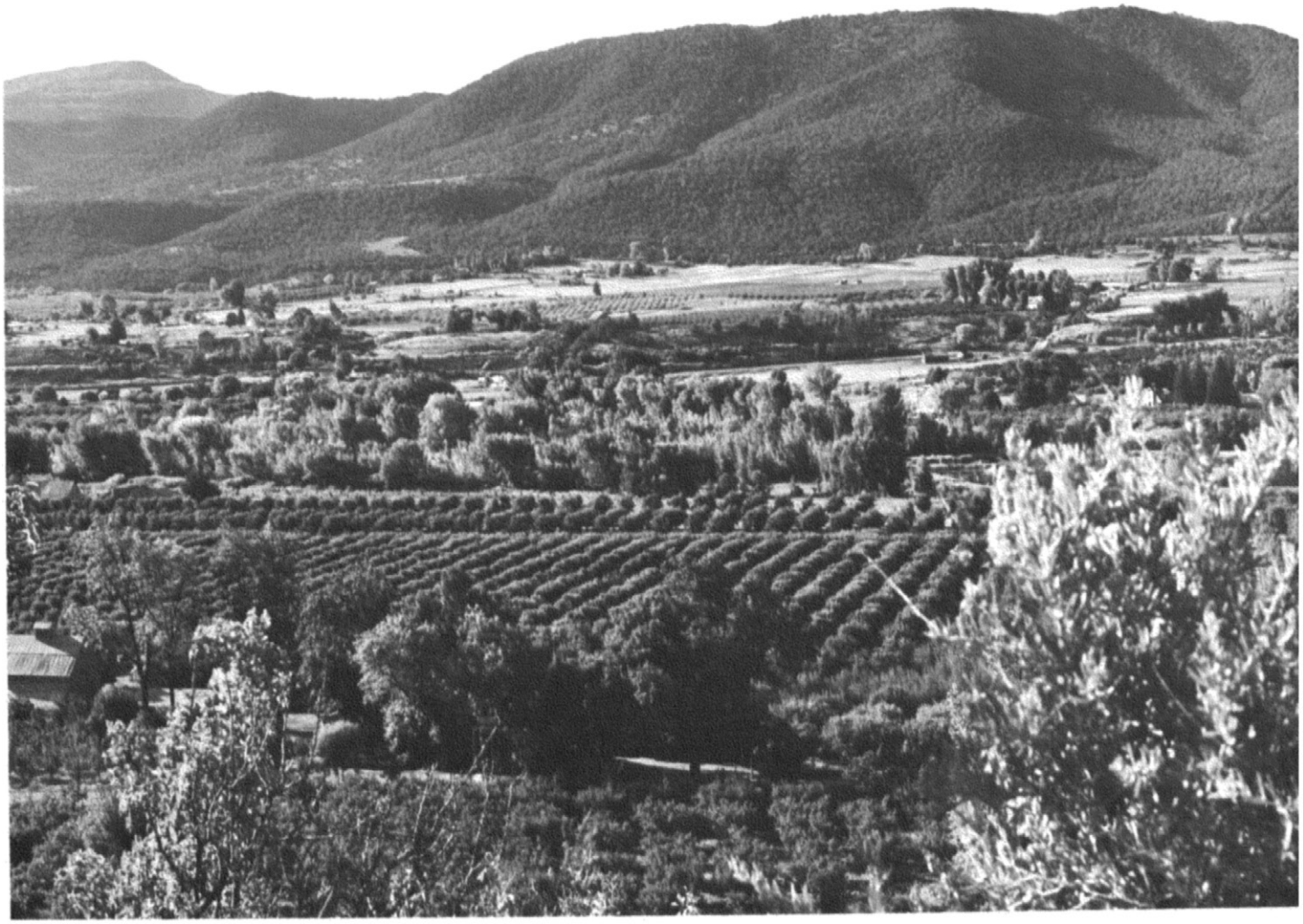
SOIL SURVEY OF

PAONIA AREA, COLORADO

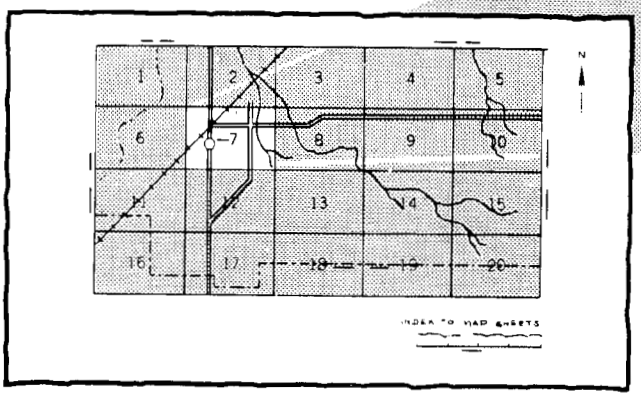
Parts of Delta, Gunnison, and Montrose Counties

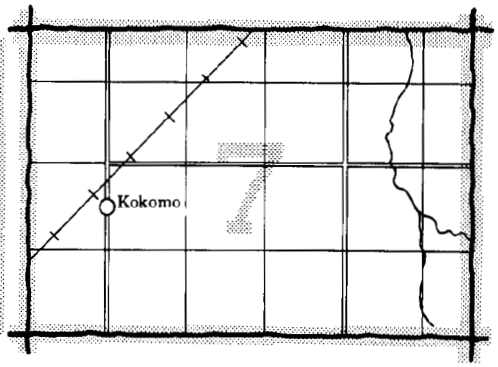


U. S. Department of Agriculture
Soil Conservation Service
in cooperation with
Colorado Agricultural Experiment Station

HOW TO USE

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





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

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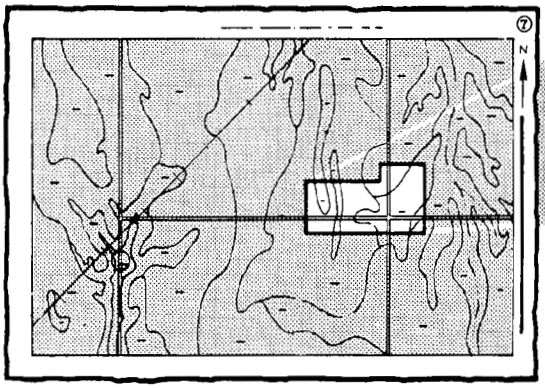
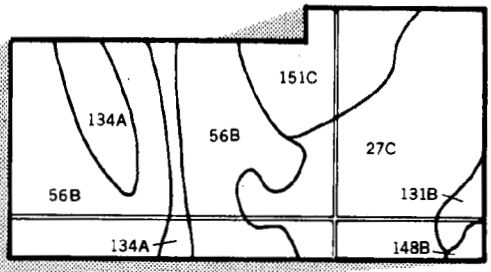
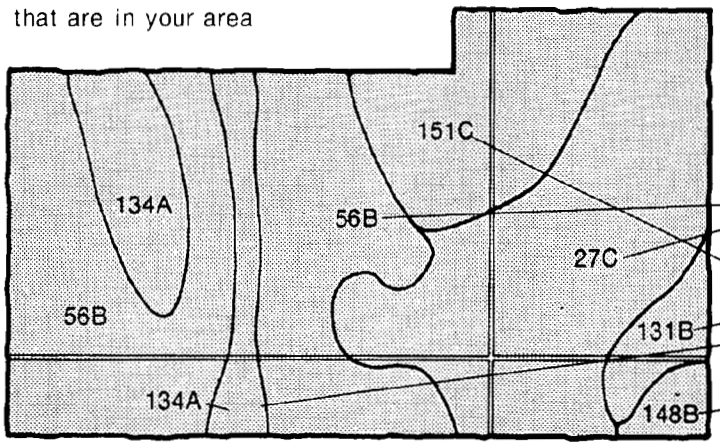




4. List the map unit symbols that are in your area



Symbols

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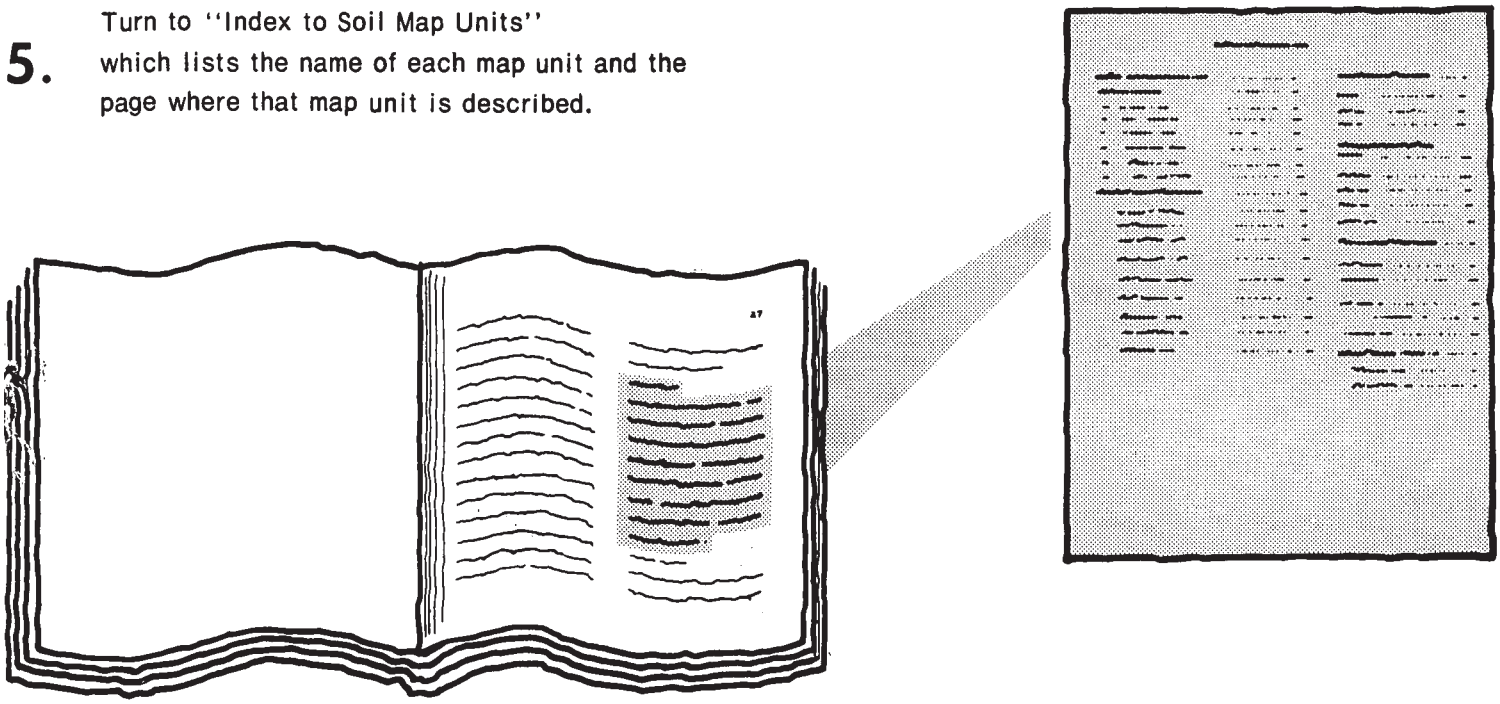
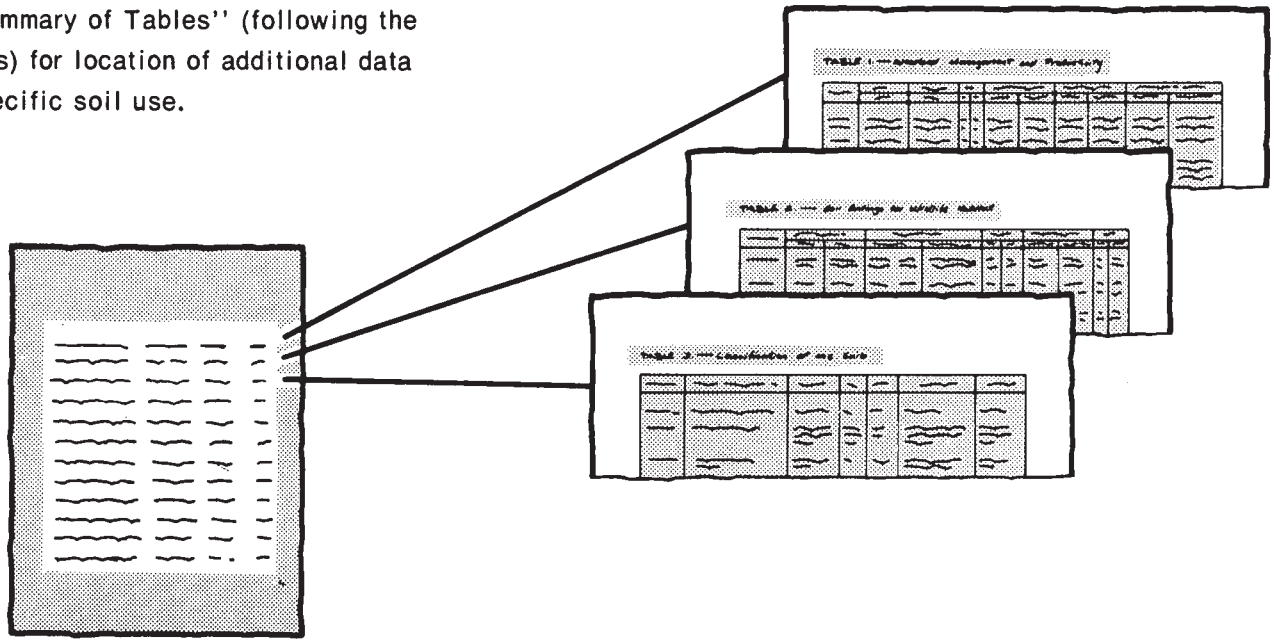
56B
131B
134A
148B
151C

THIS SOIL SURVEY

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



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



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

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

Major fieldwork for this soil survey was completed in the period 1958 to 1975. Soil names and descriptions were approved in February, 1976. Unless otherwise indicated, statements in the publication refer to conditions in the survey area in 1976. This survey was made cooperatively by the Soil Conservation Service and Colorado Agricultural Experiment Station. It is part of the technical assistance furnished to the Delta Soil Conservation District.

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

Cover: Apple orchards on Agua Fria and Mesa soils.

Contents

	Page
Index to soil map units	iv
Summary of tables	v
Foreword	vii
General nature of the survey area	1
Climate	2
How this survey was made	2
General soil map for broad land use planning	3
Descriptions of map units	3
1. Utaline-Lazear-Shavano	3
2. Mesa-Avalon	3
3. Kech-Progresso	4
4. Agua Fria-Saraton	4
5. Torriorthents-Rock outcrop	4
6. Delson-Cerro	5
7. Absarokee-Beenom	5
8. Fughes-Bulkley	5
9. Cochetopa-Northwater	5
10. Badland-Chipeta-Persayo	6
11. Billings-Gullied land	6
Broad land use considerations	6
Soil maps for detailed planning	7
Soil descriptions and potentials	8
Use and management of the soils	64
Crops and pasture	65
Yields per acre	66
Capability classes and subclasses	67
Rangeland	67
Engineering	68
Building site development	69
Sanitary facilities	70
Construction material	71
Water management	71
Recreation	72
Wildlife habitat	72
Soil properties	74
Engineering properties	74
Physical and chemical properties	75
Soil and water features	76
Classification of the soils	77
Soil series and morphology	77
Absarokee series	77
Agua Fria series	78
Apishapa series	79
Ascalon series	79
Avalon series	80
Beenom series	80
Billings series	81
Breece series	81
Bulkley series	82
Cerro series	82
Chipeta series	83
Cliffdown series	83
Cochetopa series	84
Colona series	84
Curecanti series	85
Delson series	85
Fughes series	86
Gaynor series	87
Glenton series	87
Kech series	88
Killpack series	88
Lazear series	88
Limon series	89
Meeteetse series	89
Mesa series	90
Midway series	90
Northwater series	91
Persayo series	91
Potts series	92
Progresso series	92
Radersburg series	93
Razor series	93
Saraton series	94
Scholle series	94
Shavano series	95
Uffens series	95
Utaline series	96
Work series	96
References	97
Glossary	97
Illustrations	107
Tables	111

Issued January 1981

Index to soil map units

	Page
1—Absarokee loam, 3 to 12 percent slopes	8
2—Absarokee-Work loams, 6 to 25 percent slopes	8
3—Agua Fria stony loam, 3 to 12 percent slopes	9
4—Agua Fria stony loam, 12 to 25 percent slopes	10
5—Agua Fria clay loam, 1 to 6 percent slopes	11
6—Apishapa silty clay loam, 0 to 5 percent slopes	12
7—Aquic Natrargids, saline	12
8—Ascalon sandy loam, 3 to 10 percent slopes	13
9—Avalon loam, 0 to 3 percent slopes	13
10—Avalon loam, 3 to 6 percent slopes	14
11—Badland	15
12—Beenom-Absarokee loams, 5 to 20 percent slopes	15
13—Beenom-Absarokee association, 20 to 60 percent slopes	16
14—Billings silty clay loam, 0 to 3 percent slopes	17
15—Billings silty clay loam, 3 to 6 percent slopes	18
16—Billings silty clay loam, gullied, 0 to 6 percent slopes	19
17—Breece loam, 1 to 6 percent slopes	20
18—Bulkley clay loam, 12 to 25 percent slopes	20
19—Bulkley clay loam, 25 to 65 percent slopes	21
20—Cerro loam, 1 to 6 percent slopes	21
21—Cerro loam, 6 to 12 percent slopes	22
22—Cerro stony loam, 10 to 35 percent slopes	23
23—Chipeta silty clay, 3 to 30 percent slopes	23
24—Cliffdown gravelly loam, 0 to 12 percent slopes	24
25—Cochetopa stony loam, 10 to 40 percent slopes	24
26—Colona silty clay loam, 1 to 6 percent slopes	25
27—Colona silty clay loam, 6 to 12 percent slopes	26
28—Colona silty clay loam, 12 to 40 percent slopes	27
29—Cryoborolls, very stony	27
30—Curecanti loam, 3 to 15 percent slopes	27
31—Curecanti stony loam, 3 to 30 percent slopes	28
32—Delson loam, 3 to 12 percent slopes	29
33—Delson stony loam, 3 to 20 percent slopes	29
34—Delson very stony loam, 20 to 60 percent slopes	30
35—Fluvaquents, flooded	31
36—Fluvents, flooded	31
37—Fughes loam, 5 to 15 percent slopes	31
38—Fughes loam, 15 to 25 percent slopes	32
39—Fughes loam, 25 to 65 percent slopes	33
40—Fughes stony loam, 3 to 30 percent slopes	33
41—Fughes-Curecanti stony loams, 10 to 40 percent slopes	34
42—Glenton fine sandy loam, 0 to 3 percent slopes	35
43—Glenton loam, 3 to 6 percent slopes	35
44—Gullied land	36
45—Haplaquolls, flooded	36
46—Kech-Progresso loams, 3 to 15 percent slopes	37
47—Kech-Rock outcrop complex, 10 to 40 percent slopes	38
48—Killpack silty clay loam, 3 to 12 percent slopes	38
49—Lazear-Rock outcrop complex, 3 to 30 percent slopes	39
50—Limon silty clay loam, 0 to 3 percent slopes	40
51—Limon silty clay loam, 3 to 6 percent slopes	41
52—Meeteetse stony loam, 3 to 20 percent slopes	41
53—Mesa loam, 0 to 3 percent slopes	42
54—Mesa loam, 3 to 6 percent slopes	43
55—Mesa-Utaline stony loams, 3 to 12 percent slopes	44
56—Midway-Gaynor silty clay loams, 10 to 40 percent slopes	45
57—Northwater loam, 5 to 25 percent slopes	45
58—Northwater cobbly loam, 25 to 65 percent slopes	46
59—Persayo silty clay loam, 12 to 35 percent slopes	47
60—Potts loam, 1 to 6 percent slopes	47
61—Progresso loam, 3 to 6 percent slopes	48
62—Progresso loam, 6 to 12 percent slopes	49
63—Progresso-Potts association, 1 to 6 percent slopes	49
64—Radersburg loam, 6 to 12 percent slopes	51
65—Radersburg cobbly loam, 10 to 35 percent slopes	52
66—Razor silty clay loam, 3 to 12 percent slopes	52
67—Rock outcrop	53
68—Saraton gravelly loam, 3 to 12 percent slopes	53
69—Saraton stony loam, 3 to 20 percent slopes	54
70—Saraton-Agua Fria complex, 20 to 50 percent slopes	55
71—Scholle stony loam, 3 to 12 percent slopes	56
72—Scholle stony loam, 12 to 40 percent slopes	56
73—Shavano-Lazear complex, 3 to 12 percent slopes	57
74—Torriorthents-Haplargids complex, very stony	58
75—Torriorthents-Rock outcrop, sandstone, complex	59
76—Torriorthents-Rock outcrop, shale, complex	59
77—Uffens sandy loam, 0 to 5 percent slopes	59
78—Utaline sandy loam, 3 to 12 percent slopes	60
79—Utaline stony loam, 3 to 30 percent slopes	61
80—Utaline-Torriorthents complex	61
81—Work loam, 3 to 6 percent slopes	62
82—Work loam, 6 to 12 percent slopes	63
83—Work loam, 12 to 25 percent slopes	63

Summary of tables

Page

Acreage and proportionate extent of the soils (Table 10) 118
Delta County. Gunnison County. Montrose County. Total—Area, Extent.

Building site development (Table 13) 130
Shallow excavations. Dwellings without basements. Dwellings with basements. Small commercial buildings. Local roads and streets.

Classification of the soils (Table 22) 184
Soil name. Family or higher taxonomic class.

Construction materials (Table 15) 144
Roadfill. Sand. Gravel. Topsoil.

Engineering properties and classifications (Table 19) 167
Depth. USDA texture. Classification—Unified, AASHTO. Fragments greater than 3 inches. Percentage passing sieve number—4, 10, 40, 200. Liquid limit. Plasticity index.

Freeze dates in spring and fall (Tables 4, 5, and 6) 115
Probability. Minimum temperature.

Growing season length (Tables 7, 8, and 9) 116
Probability. Daily minimum temperature during growing season.

Physical and chemical properties of soils (Table 20) 175
Depth. Permeability. Available water capacity. Soil reaction. Salinity. Shrink-swell potential. Risk of corrosion—Uncoated steel, Concrete. Erosion factors—K, T. Wind erodibility group.

Rangeland productivity and characteristic plant communities (Table 12) 122
Range site. Total production—Kind of year, Dry weight. Characteristic vegetation. Composition.

Recreational development (Table 17) 156
Camp areas. Picnic areas. Playgrounds. Paths and trails.

Sanitary facilities (Table 14) 137
Septic tank absorption fields. Sewage lagoon areas. Trench sanitary landfill. Area sanitary landfill. Daily cover for landfill.

Soil and water features (Table 21) 180
Hydrologic group. Flooding—Frequency, Duration, Months. High water table—Depth, Kind, Months. Bedrock—Depth, Hardness. Potential frost action.

Summary of Tables—Continued

Page

Temperature and precipitation data (Tables 1, 2, and 3) 112
Month. Temperature—Average daily maximum, Average daily minimum, Average daily, Average number of growing degree days. Precipitation—Average, Average number of days with 0.10 inch or more, Average snowfall.

Water management (Table 16) 150
Pond reservoir areas. Embankments, dikes, and levees. Drainage. Irrigation. Terraces and diversions. Grassed waterways.

Wildlife habitat potentials (Table 18) 162
Potential for habitat elements—Grain and seed crops, Grasses and legumes, Wild herbaceous plants, Coniferous plants, Shrubs, Wetland plants, Shallow water areas. Potential as habitat for—Openland wildlife, Woodland wildlife, Wetland wildlife, Rangeland wildlife.

Yields per acre of crops and pasture (Table 11) 120
Sugar beets, Barley, Corn, Corn silage, Alfalfa hay, Grass hay.

Foreword

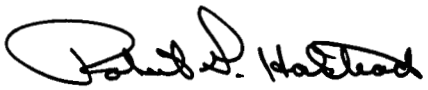
The Soil Survey of Paonia Area, Colorado, contains much information useful in any land-planning program. Of prime importance are the predictions of soil behavior for selected land uses. Also highlighted are limitations or hazards to land uses that are inherent in the soil, improvements needed to overcome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

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

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

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

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



Robert G. Halstead
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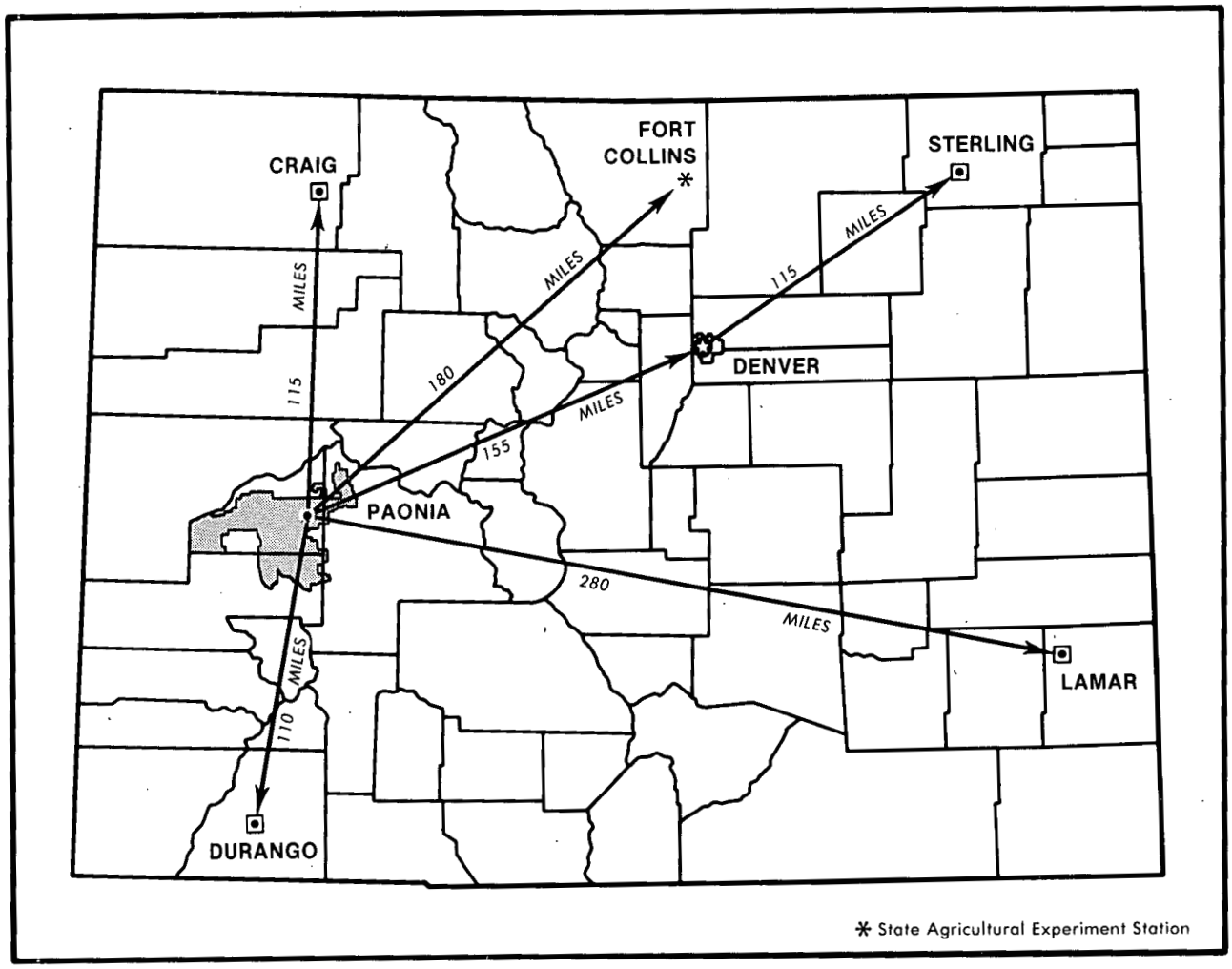

Location of Paonia Area in Colorado.

SOIL SURVEY OF PAONIA AREA, COLORADO,

PARTS OF DELTA, GUNNISON, AND MONTROSE COUNTIES

By William R. Hunter, Soil Conservation Service

Soils surveyed by William R. Hunter, Louis A. Fletcher, Roy J. Larsen, Donald E. Boyer, Terry J. Hughes, and Darrell L. Schroeder, Soil Conservation Service

United States Department of Agriculture, Soil Conservation Service, in cooperation with Colorado Agricultural Experiment Station

The Paonia Area is in the west-central part of Colorado in the Rocky Mountains. (See map on facing page.) The survey area is mostly in Delta County, and part of it is in Montrose and Gunnison Counties. The survey area covers about 653,640 acres, or 1,021 square miles. Delta is the county seat of Delta County.

The survey area consists of a series of open valleys, terraces, and mesas that are flanked by high mountains. It is bounded on the north by Grand Mesa, on the south by Black Mesa, on the east by Elk Mountains, and on the west by Black Canyon and Uncompahgre Plateau. Elevation ranges from about 4,800 feet in the northwestern corner, where the Gunnison River leaves the survey area, to about 9,800 feet in the eastern part.

The survey area is drained by the North Fork of the Gunnison River, Smith Fork, Crystal Creek, Surface Creek, Tongue Creek, Escalante Creek, and Dominguez Creek. These are all tributaries of Gunnison River. Gunnison River enters the survey area from the south through Black Canyon of the Gunnison and flows in a north-westerly direction. It leaves the survey area at the extreme northwestern corner near the Mesa County line.

Because of low annual precipitation, the seasonal distribution of moisture, and a short growing season, the soils in the survey area are unsuited to dryland farming. Irrigation is needed for most crops. About 45,640 acres in the survey area are used for irrigated crops. Raising of livestock, mainly cattle and sheep, is a major farm enterprise. Orchard crops are important to the economy of the area. Coal is mined extensively in North Fork Valley and the Surface Creek Valley. Urbanization is rapidly expanding in the survey area.

General nature of the survey area

The first European explorers entered the Paonia Area in 1776. They were two Spanish priests, Father Escalante and Father Dominguez, who were looking for an overland route from Sante Fe to the Spanish missions in Monterey, California.

In 1881 a treaty between the United States and the Ute Indians opened the areas of North Fork Valley, Surface Creek Valley, and Crawford for settlement.

Irrigation was important in the development of the survey area. Early pioneers settled near major streams from which irrigation water could be easily diverted, and irrigation companies eventually were formed. Canals and reservoirs were built and natural lakes improved on Grand Mesa to provide water for much of the area that is presently irrigated.

Raising of cattle and sheep was the main farm enterprise during the period of early development. In 1890 a railroad was built through the town of Austin and was later extended to the town of Sommerset. The railroad opened the way for coal mining in North Fork Valley and stimulated settlement and agricultural development in the survey area.

Nearly level flood plains, low terraces and alluvial fans are adjacent to major streams and tributaries. High terraces, mesas, pediments, and rolling to steep mountains are between the streams and are dissected by drainageways that flow toward Gunnison River. In many places the Gunnison River and its tributaries are deeply incised in canyons that are as much as 1,000 feet deep.

Soil is the most important natural resource in the survey area. It produces feed for livestock, cultivated crops, hay crops, orchard crops, and woodland. Good quality irrigation water is available for most of the soils that are irrigated.

About 412,000 acres in the survey area is rangeland that is used for grazing cattle and sheep. Cattle raising consists mainly of cow-calf operations. Livestock are fed hay and supplements during winter and graze at higher elevations during summer.

The major crops grown in the area are alfalfa, small grains, grass hay, corn, and sugar beets. Corn for seed and sugar beets require a long growing season. Malting

barley is grown as a cash crop on an increasing acreage.

Orchard crops are important to the economy of the area. About 6,335 acres are in fruit trees. About 72 percent of this acreage is used for apples, and the rest is used for peaches, cherries, pears, and plums.

The demand for native woodland products is increasing in the survey area. About 196,000 acres is in woodland consisting of aspen, cottonwood, pinyon, and juniper. Aspen and cottonwood are used for lumber and firewood. Pinyon and juniper are used for fenceposts and firewood.

Recreation is an increasing land use in the survey area. Soil and water resources provide hunting, fishing, camping, picnicking, and other outdoor recreational activities. Horseback riding and pack trips are available at resorts in the area (fig. 1). Many streams and reservoirs provide several species of mountain trout. Many deer, elk, pheasants, grouse, ducks, and rabbits are also in the survey area.

Climate

Summers in the survey area are warm or hot in most valleys but are much cooler in the mountains. Winters are cold in the mountains. Valleys are colder than the lower slopes of adjacent mountains because of cold air drainage. Precipitation occurs in the mountains throughout the year, and a deep snowpack accumulates during winter. In most years snowmelt supplies more water than can be used for farming in the survey area. In valleys, precipitation in summer falls as showers and some thunderstorms occur. In winter the ground is covered with snow much of the time. Chinook winds, which blow downslope and are warm and dry, often melt the snow and cause moisture to evaporate.

Tables 1, 2, and 3 give data on temperature and precipitation for the survey area, as recorded at Cedaredge, Delta, and Paonia for the period 1951 to 1974. Tables 4, 5, and 6 show probable dates of the first freeze in fall and the last freeze in spring. Tables 7, 8, and 9 provide data on length of the growing season.

In winter the average temperature is 29 degrees F, and the average daily temperature is 16 degrees. The lowest temperature on record, which occurred at Paonia on January 13, 1963, is -31 degrees. In summer the average temperature is 70 degrees. The average daily maximum temperature is 85 degrees in most of the survey area but is about 90 degrees near Delta. The highest recorded temperature, which occurred at Delta on June 23, 1954, is 106 degrees.

Growing degree days, shown in tables 1, 2, and 3, 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.

Of the total annual precipitation, 7 inches, or 50 percent, usually falls in April through September, which includes the growing season for most crops. In 2 years out of 10, the rainfall in April through September is less than 5 inches. The heaviest 1-day rainfall during the period of record was 2.18 inches at Cedaredge on October 13, 1957. Thunderstorms number about 35 each year, and about 21 thunderstorms occur in summer.

Average seasonal snowfall is 45 inches in most of the survey area but is 15 inches at Delta. The greatest snow depth at any one time during the period of record was 35 inches. On the average, 20 to 25 days have at least 1 inch of snow on the ground, but the number of such days varies greatly from year to year. At Delta about 10 days have at least 1 inch of snow on the ground.

The average relative humidity in midafternoon during spring is less than 33 percent and during the rest of the year is about 44 percent. Humidity is higher at night, and the average at dawn is about 59 percent. The percentage of possible sunshine is 77 in summer and 61 in winter. The prevailing wind is from the east-southeast. Average windspeed is highest, 10 miles per hour, in June.

How this survey was made

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

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

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

The areas shown on a soil map are called soil map units. Some map units are made up of one kind of soil,

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

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

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

General soil map for broad land use planning

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

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

Because of its small scale, the map does not show the kind of soil at a specific site. Thus, it is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The kinds of soil in any one map unit differ from place to place in slope, depth, stoniness, drainage, or other characteristics that affect their management.

Major land uses considered are cultivated farm crops, special crops, woodland, urban uses, and recreation areas. Cultivated farm crops are those grown extensively by farmers in the survey area. Special crops include fruits and nursery crops grown on limited acreage and generally requiring intensive management. Woodland refers to land that is producing either trees native to the area or introduced species. Urban uses include residential, commercial, and industrial developments. Recreation areas include campsites, picnic areas, ballfields, and other areas that are subject to heavy foot traffic and areas used for nature study and as wilderness.

Descriptions of map units

1. Utaline-Lazear-Shavano

Deep to shallow, gently sloping to steep, well drained stony loam, gravelly loam, and fine sandy loam that formed in outwash alluvium derived from basalt and residuum derived from sedimentary rock

This map unit is in the southern and west-central parts of the survey area. The soils are on mesas and benches and on back slopes of steep uplands.

This map unit makes up about 9 percent of the survey area. About 40 percent of the map unit is Utaline soils, 20 percent is Lazear soils, and 10 percent is Shavano soils. The rest is soils and miscellaneous areas of minor extent.

Utaline soils are deep and have a high content of rock fragments. They have a stony loam surface layer. The parent materials form a mantle that is many feet thick and overlies sedimentary rock. Lazear and Shavano soils are closely intermingled on the landscape and formed in material weathered in place from sandstone and interbedded shale. Lazear soils are shallow and have a gravelly loam surface layer. Shavano soils are moderately deep and have a fine sandy loam surface layer.

Soils and miscellaneous areas of minor extent are the Meeteetse, Glenton, Chipeta, Persayo, and Billings soils; Torriorthents; shale rock outcrops; and Badland.

Nearly all of this map unit is in native vegetation and is used for range. Some areas of steep soil are unstable, and small landslides are common.

This map unit has poor potential for cultivated crops. Shallow soil depth, stoniness and low annual precipitation are the main limitations to farming. This map unit is suited to spring and fall grazing of livestock and has potential for wildlife habitat and recreational purposes.

2. Mesa-Avalon

Deep, nearly level to strongly sloping, well drained loam that formed in alluvium derived from igneous rock

This map unit is in the west-central part of the survey area on old, high terraces; mesas; and alluvial fans.

This map unit makes up about 3 percent of the survey area. About 55 percent of the map unit is Mesa soils, 15 percent is Avalon soils, and the rest is soils of minor extent.

Mesa soils are on slightly elevated ridgetops and on steeper side slopes than Avalon soils. Both of these soils have a loam surface layer. Mesa soils are cobbly or stony in some areas and have a clay loam subsoil.

Soils of minor extent are Apishapa, Utaline, and Billings soils; Fluvents; and Fluvaquents.

Most of this map unit is irrigated and is used for cultivated crops, pasture, and orchard crops. Some areas are not irrigated; they are in native vegetation and are used for range, recreational purposes, and wildlife habitat.

Cobbles and stones on the surface and in the profile are the main limitations to the use of the soils. Stone removal is a common practice.

3. Kech-Progresso

Shallow and moderately deep, gently sloping to steep, well drained loam that formed in alluvium and residuum derived from sedimentary rock

This map unit consists of gently sloping, hilly and steep soils that are mostly in the southern and western parts of the survey area. The soils are on alluvial fans, benches, and back slopes of steep uplands.

This map unit makes up about 9 percent of the survey area. About 35 percent of the map unit is Kech soils, 30 percent is Progresso soils, and the rest is soils and miscellaneous areas of minor extent.

Kech soils are on small ridges and in more strongly sloping areas. Progresso soils are in less sloping areas and in small depressions. Both of these soils have a loam surface layer. Kech soils have partially-weathered sandstone bedrock above a depth of 20 inches. Progresso soils have sandstone bedrock at a depth of 20 to 40 inches.

Soils and miscellaneous areas of minor extent are Potts, Apishapa, and Glenton soils; very stony Torriorthents and Haplargids; and sandstone rock outcrops.

About half of the acreage of this map unit is irrigated and is used for hay, small grains, and some cultivated crops. Some areas are not irrigated; they are in native vegetation and are used for range, wildlife habitat, and recreational purposes.

Depth to bedrock is the main limitation to the use of these soils for farming and for some nonfarm uses. Potential for development of wildlife habitat is good.

4. Agua Fria-Saraton

Deep and moderately deep, nearly level to steep, well drained gravelly loam and stony loam that formed in outwash alluvium derived from igneous rock

This map unit is mainly in the north-central part of the survey area. The soils are on old, high terraces; mesas; and steep back slopes of uplands.

This map unit makes up about 18 percent of the survey area. About 40 percent of the map unit is Agua Fria soils, 20 percent is Saraton soils, and the rest is soils of minor extent.

Both of these soils are in a similar position on the landscape. Agua Fria soils have a stony loam surface layer and a clay loam subsoil. They commonly have a clay loam surface layer in plowed areas. Saraton soils mainly have a gravelly or stony loam surface layer and underlying layers and have pinkish white marl at a depth of 20 to 40 inches.

The soils of minor extent are Midway, Gaynor, Colona, Ascalon, and Scholle soils and Fluvaquents.

The less sloping areas of this map unit are irrigated and are used for cultivated crops, small grains, hay, and orchard crops. Areas that are not irrigated are in native vegetation and are used for range, recreational purposes, and wildlife habitat.

Cobbles and stones on the surface and in the profile are the main limitations to the use of the soils. Stone removal is a common practice.

5. Torriorthents-Rock outcrop

Shallow to deep, moderately steep to very steep, well drained stony soils that formed in residuum, colluvium, and alluvium derived from sedimentary rock, and Rock outcrop

This map unit is in areas throughout the survey area but is mainly in the southern and western parts. The soils are on steep side slopes of canyons, in areas below rock escarpments, and on low terraces and alluvial fans.

This map unit makes up about 17 percent of the survey area. About 65 percent of the map unit is Torriorthents, and 15 percent is Rock outcrop. The rest is soils of minor extent.

Torriorthents are lower on side slopes than the Rock outcrop and are between escarpments. Torriorthents have little or no soil development. The surface layer is very stony and ranges from sandy loam to clay loam. The underlying material is cobbly, stony and bouldery sandy loam, loam, or clay loam. Rock outcrop is on the upper margin of side slopes. It is dominantly hard sedimentary and igneous rock.

Soils and miscellaneous areas of minor extent are Glenton, Cliffdown, and Uffens soils; very stony Torriorthents and Haplargids; Fluvents; Fluvaquents; and Badland.

This map unit is used mainly for recreational purposes and wildlife habitat. A small acreage is used for irrigated crops.

Steepness of slope, stoniness, and the presence of Rock outcrop are severe limitations to most uses of the soils in this unit. However, Glenton soils in this unit are well suited to cultivated crops, hay, small grains, and orchard crops.

6. Delson-Cerro

Deep, nearly level to steep, well drained loam and stony loam that formed in outwash alluvium derived from igneous rock

This map unit is mainly in the northern and eastern parts of the survey area. The soils are on old fans, mesas, and steep back slopes of mountains.

This map unit makes up about 15 percent of the survey area. About 45 percent of the map unit is Delson soils, 20 percent is Cerro soils, and the rest is soils and miscellaneous areas of minor extent.

Delson and Cerro soils are in a similar position on the landscape. They have a loam or stony loam surface layer and a clayey subsoil. Cerro soils are calcareous below a depth of about 26 inches.

Soils and miscellaneous areas of minor extent are Beenom, Absarokee, Work, Radersburg, Fughes, and Cochetopa soils; Torriorthents; Fluvents; Fluvaquents; and sandstone rock outcrops.

This map unit is used mainly for range, recreational purposes, and wildlife habitat. If the soils are irrigated, they have good potential for small grains, hay, and pasture.

The main limitations to the use of the soils for farming are surface stoniness and a short growing season. Stone removal is a common practice.

7. Absarokee-Beenom

Shallow and moderately deep, gently sloping to very steep, well drained loam that formed in residuum derived from sedimentary rock

This map unit is mainly in the southeastern part of the survey area. The soils are on fans, rolling uplands, and steep and very steep mountains.

This map unit makes up about 12 percent of the survey area. About 35 percent of the map unit is Absarokee soils, 20 percent is Beenom soils, and the rest is soils and miscellaneous areas of minor extent.

In most places, Beenom soils are on the upper part of the slope. Absarokee soils are lower on the landscape than Beenom soils; they are on foot slopes and fans. Both of these soils have a loam surface layer. Beenom soils have partially weathered bedrock above a depth of 20 inches. Absarokee soils have bedrock at a depth of 20 to 40 inches.

Soils and miscellaneous areas of minor extent are Apishapa, Radersburg, Cerro, and Work soils; Torriorthents; sandstone rock outcrops; Fluvents; and Fluvaquents.

This map unit is mainly in native vegetation and is used for range. Where irrigation water is available, the less sloping, deeper soils are used for crops. Hay, small grains, and irrigated pasture are the principal crops.

The main limitations to the use of the soils for farming are depth to bedrock and a short growing season. The less sloping, deeper soils in the unit are well suited to cool season crops.

8. Fughes-Bulkley

Deep, gently sloping to very steep, well drained loam and clay loam that formed in alluvium derived from sedimentary rock

This map unit is mainly in the northeastern part of the survey area. A small acreage is in the southeastern part. The soils are on fans, uplands, and mountains.

This map unit makes up about 6 percent of the survey area. About 65 percent of the map unit is Fughes soils, 25 percent is Bulkley soils, and the rest is soils of minor extent.

Fughes soils are somewhat lower in elevation than Bulkley soils. Soil material has been moved downslope by water and gravity. Fughes soils have a loam surface layer and have a redder subsoil than Bulkley soils. Bulkley soils have a clay loam surface layer and have weathered shale at a depth of 40 to 70 inches.

Soils of minor extent are Breece and Curecanti soils, Cryoborolls that are very stony, and Fluvaquents.

This map unit is used mainly for grazing in summer, recreational purposes, and wildlife habitat. Some areas are used for hay, pasture, and small grains. The main limitations to the use of the soils are a short growing season, steepness of slope, and, in some areas, surface stoniness. Potential for wildlife habitat is good. Deer and elk frequent areas of this unit in summer and commonly graze on the sunny slopes during winter.

9. Cochetopa-Northwater

Deep, moderately sloping to very steep, well drained stony loam and loam that formed in outwash alluvium and glacial drift derived from igneous rock

This map unit is in the northern and eastern parts of the survey area. The soils are on mountains, valleys, and alluvial fans.

This map unit makes up about 3 percent of the survey area. About 60 percent of the map unit is Cochetopa soils, 20 percent Northwater soils, and the rest is soils of minor extent.

Cochetopa and Northwater soils are at about the same elevation and are in a similar position on the landscape. They are on side slopes. Cochetopa soils have a stony loam surface layer and have less than 35 percent stones in the subsoil. Northwater soils have a loam or cobbly loam surface layer and have more than 35 percent cobbles and gravel in the subsoil.

Soils of minor extent are Delson, Fughes, and Curecanti soils and Cryoborolls that are very stony.

Most of this map unit is used for range, recreational purposes, wildlife habitat, and woodland. The trees are mainly aspen and are not harvested for commercial uses. Stoniness, a short growing season, and steepness

of slope are the main limitations to the use of the soils. Grazing of livestock is limited to summer.

10. Badland-Chipeta-Persayo

Badland, and shallow, gently sloping to rolling, well drained silty clay and silty clay loam that formed in residuum derived from shale

This map unit is scattered throughout the survey area. It makes up about 5 percent of the survey area. About 70 percent of the map unit is Badland, 5 percent is Chipeta soils, 4 percent is Persayo soils, and the rest is soils of minor extent.

In most places Badland is on steep or very steep back slopes. Chipeta and Persayo soils are on rolling uplands and in less sloping areas. Chipeta soils have a silty clay surface layer and underlying layers. Persayo soils have a silty clay loam surface layer and underlying layers. Both of these soils are less than 20 inches deep to shale.

Soils of minor extent are Billings, Killpack, Mesa, Utaline, and Agua Fria soils; Torriorthents; and Aquic Natrargids.

This map unit is used mainly for range, recreational purposes, and wildlife habitat. Some small areas are irrigated and are used for small grains, hay, and pasture. The main limitations to the use of the soils are shallow soil depth and severe hazard of erosion. Areas of this map unit produce a large amount of sediment. The soils are unstable, and gullies form readily.

11. Billings-Gullied land

Deep, nearly level to gently sloping, well drained silty clay loam that formed in alluvium derived from shale, and Gullied land

This map unit is in scattered areas throughout the central part of the survey area. The soils are on recent alluvial fans and valley-filling slopes.

This map unit makes up about 3 percent of the survey area. About 50 percent of the map unit is Billings soils, 20 percent is Gullied land, and the rest is soils and miscellaneous areas of minor extent.

Billings soils are on the edge of valleys. Gullied land is near the center of the valley in places where runoff accumulates. Billings soils are deep. They have a surface layer of silty clay loam and have underlying material that is stratified with clay loam, sand, and gravel in the lower part. Gullied land has deeply incised gullies that are 20 to 30 feet wide.

Soils and miscellaneous areas of minor extent are Killpack, Limon, Glenton, and Utaline soils; Aquic Natrargids; Fluvaquents; and Badland.

This map unit is used mainly for range, recreational purposes, and wildlife habitat. Where irrigation water is available, the soils are suited to cultivated crops, hay, and pasture. Unstable soils that erode readily are the main limitations to the use of this map unit. Piping and gulley erosion are severe hazards. This map unit produces a large amount of sediment.

Broad land use considerations

Deciding which land should be used for urban development is an important issue in the survey area. Each year a considerable acreage is developed for urban uses near Cedaredge, Eckert, Hotchkiss, and Paonia and near other towns in the survey area. About 10,000 acres, or less than 2 percent of the survey area, is urban or built-up land. The general soil map can be used in planning the general outline of urban areas, but it cannot be used to select specific sites for urban structures. In general, soils in the survey area that have good potential for cultivated crops also have good potential for urban development. Information about specific soils that is contained in the soil survey can be used in planning land use patterns.

Areas where the soils are so unfavorable that urban development is prohibitive are not extensive. However, a large part of the Torriorthents-Rock outcrop units is on steep slopes and has severe limitations for urban development. Also, urban development is very costly on the Badland-Chipeta-Persayo map unit and on the unstable soils in the Billings-Gullied land map unit. In many areas of the Absarokee-Beenom map unit, the soils are steep and have hard bedrock at a depth of a few feet; urban development in these areas is costly. The clayey soils in the Delson-Cerro map unit have poor potential for urban development because of high shrink-swell potential and the presence of large stones.

Urban development is less costly on some of the soils than on the soils named in the preceeding paragraph. These include soils in the Mesa-Avalon map unit that are nearly level or gently sloping and the less sloping soils in the Agua Fria-Saraton and Kech-Progresso map units. The Mesa-Avalon map unit is good farmland, and its potential for farming should not be overlooked when broad land uses are considered. The Agua Fria-Saraton and Kech-Progresso map units consist of soils that are stony or are underlain by bedrock at a depth of less than 40 inches; however, the rolling landscape, good soil drainge, and other soil qualities are favorable for residential developments and other nonfarm uses.

The Mesa-Avalon and Agua Fria-Saraton map units are suited to orchard crops and other special crops if stones are removed. Less sloping soils in the Kech-Progresso map unit also are suited to these crops. These soils are well drained and warm earlier in spring than soils at a higher elevation. Where depth to bedrock is sufficient, these soils are also well suited to nurseries.

The Cochetopa-Northwater map unit has fair to poor potential for woodland. Trees either do not grow well or produce wood of poor quality. Production of noncommercial trees is common on the Agua Fria-Saraton and Kech-Progresso map units.

The hilly Cochetopa-Northwater and Fughes-Bulkley map units have excellent potential for summer grazing and for extensive recreation areas.

Soil maps for detailed planning

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

Preceding the name of each map unit is the symbol that identifies the soil on the detailed soil maps. Each soil description includes general facts about the soil and a brief description of the soil profile. The potential of the soil for various major land uses, for example, crops, irrigated pasture, nonirrigated pasture, range, woodland, wildlife habitat, orchards, and urban development, is estimated. In each description, the principal hazards and limitations are indicated, and the management concerns and practices needed are discussed.

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

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

Soils of one series can differ in texture of the surface layer or in the underlying substratum and in slope, erosion, stoniness, salinity, wetness, or other characteristics that affect their use. On the basis of such differences, a soil series is divided into phases. The name of a *soil phase* commonly indicates a feature that affects use or management. For example, Fughes loam, 15 to 25 percent slopes, is one of several phases within the Fughes series.

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

A *soil complex* consists of areas of two or more soils that are so intricately mixed or so small in size that they cannot be shown separately on the soil map. Each area includes some of each of the two or more dominant soils, and the pattern and proportion are somewhat similar in all areas. Absarokee-Work loams, 6 to 25 percent slopes, is an example.

A *soil association* is made up of soils that are geographically associated and are shown as one unit on the map because it is not practical to separate them. A soil association has considerable regularity in geographic pattern and in the kinds of soil that are a part of it. The extent of the soils can differ appreciably from one delineation to another; nevertheless, interpretations can be made for use and management of the soils. Beenom-Absarokee association, 20 to 60 percent slopes, 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 there is little value in separating them. The pattern and proportion of the soils are not uniform. An area shown on the map has at least one of the dominant (named) soils or may have all of them. No undifferentiated groups are in this survey area.

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

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

This survey area has both narrowly defined and broadly defined map units. Narrowly defined units contain a lower percent of soils other than those shown in the name of the unit, and the soils were examined at close intervals. Broadly defined units contain a higher percent of soils other than shown in the name of the unit. Composition generally is more variable and the soils were examined at wider intervals than those for narrowly defined units. Mapping has been controlled well enough, however, for the anticipated use of the soils. Broadly defined units are indicated in the Soil Legend by an asterisk.

The acreage and proportionate extent of each map unit are given in table 10, and additional information on properties, limitations, capabilities, and potentials for many soil uses is given for each kind of soil in other tables in this survey. (See "Summary of tables.") Many of the terms used in describing soils are defined in the Glossary.

Soil descriptions and potentials

1—Absarokee loam, 3 to 12 percent slopes. This is a moderately deep, well drained soil that overlies weathered sandstone at a depth of 20 to 40 inches. It formed in material weathered from sandstone and is on uplands and valley side slopes. Elevation ranges from 6,800 to 8,500 feet. Average annual precipitation is about 15 to 20 inches, average annual air temperature is about 44 degrees F, and the average frost-free season is about 90 days.

Typically the surface layer is dark grayish brown loam about 7 inches thick. The subsoil is brown clay about 18 inches thick. The substratum is light brown channery clay loam. Sandstone is at a depth of about 30 inches.

Permeability is moderately slow, and available water capacity is low. Effective rooting depth is about 20 to 40 inches. Surface runoff is medium. The hazard of erosion from wind is slight and from water is moderate.

Included with this soil in mapping are a few small areas of Beenom and Work soils. Also included are some areas where the surface layer is light clay loam and small areas where gravel, cobbles, and stones are on the surface.

The native vegetation on this soil consists mainly of Gambel oak, serviceberry, big sagebrush, wheatgrasses, and brome.

Most areas of this soil are used for grazing of livestock and wildlife and for recreational purposes. Some areas are irrigated and are used mainly for hay, small grains, and pasture.

This soil is suited to short-season crops commonly grown in the survey area. Extreme care is needed to prevent water and wind erosion. The soil should be kept in legumes, grasses, or close-growing crops at least half of the time. Moisture intake rate is moderate, and the soil should be worked at the proper moisture content. Land leveling, good management of irrigation water, and the use of crop residue help to conserve irrigation water, control erosion, and maintain organic matter content. Using green manure crops and using grasses and legumes in rotation also help to maintain organic matter content and to control erosion.

This soil can be used for irrigated pasture and hay crops. It is well suited to smooth brome, orchardgrass, intermediate wheatgrass, alfalfa, and clover. Irrigation can be done by contour ditch, corrugation, and furrow methods.

Because annual precipitation is low and has poor seasonal distribution, this soil is not suited to nonirrigated crops. However, nonirrigated pasture can be planted late in summer and in fall to protect the soil from erosion and to provide grazing for livestock, if good pasture management is practiced. Crested wheatgrass, smooth brome, pubescent wheatgrass, and Kentucky bluegrass are adapted species.

The potential plant community on this soil consists mainly of Gambel oak, mountain brome, nodding brome, slender wheatgrass, and elk sedge. As range condition deteriorates, mountain brome, nodding brome, slender wheatgrass, and elk sedge decrease, and forbs and woody shrubs increase, and undesirable weeds and annual plants invade and become more abundant.

Seeding is advisable if range is in poor condition. Slender wheatgrass and western wheatgrass are suitable for seeding. Grasses that meet the seasonal requirements of livestock should be selected. Preparing a seedbed and drilling the seed help to obtain the best results. On some sites, control of competing shrubs is required to improve range condition. Seeded or brushed areas should be fenced.

This soil is used for winter range by mule deer and elk. Some important plant species that can be managed for optimum production are bitterbrush, mountainmahogany, Gambel oak, serviceberry, and elk sedge. Berry-producing shrubs are used by black bear. This soil provides habitat for Merriam turkey, blue grouse, and band-tailed pigeon. In favorable years mature Gambel oaks produce acorns, which are used by Merriam turkey.

If this soil is used for urban development, the main limitation is depth to bedrock. Moderately slow permeability is a limitation to the use of this soil for septic tank absorption fields. The limitations can be overcome by the use of proper design and construction methods.

This soil is in capability subclass IVe, irrigated and nonirrigated.

2—Absarokee-Work loams, 6 to 25 percent slopes. These moderately sloping to moderately steep soils are on uplands and valley side slopes. Elevation ranges from 6,800 to 8,500 feet. Average annual precipitation is about 17 inches, average annual air temperature is about 44 degrees F, and the average frost-free season is about 90 days.

The Absarokee soil makes up about 40 percent of this complex and is on the steeper side slopes and on small ridges. The Work soil makes up about 40 percent and is in depressions and swales.

Included with this complex in mapping are a few small areas of Beenom, Kech, Progresso, and Potts soils and Fluvents, flooded. Also included are some areas where the surface layer is light clay loam or sandy loam and small areas where gravel, cobbles, and stones are on the surface. The included areas make up 20 percent of the complex.

The Absarokee soil is moderately deep and well drained and overlies sandstone at a depth of 20 to 40 inches. It formed in material weathered from sandstone.

Typically the surface layer of the Absarokee soil is dark grayish brown loam about 7 inches thick. The subsoil is brown clay about 18 inches thick. The substratum is light brown channery clay loam. Sandstone is at a depth of about 30 inches.

In the Absarokee soil, permeability is moderately slow and available water capacity is low. Effective rooting depth is 20 to 40 inches. Surface runoff is medium. The hazard of erosion from wind is slight and from water is moderate.

On the Absarokee soil the native vegetation consists mainly of Gambel oak, serviceberry, big sagebrush, wheatgrasses, and bromes.

The Work soil is deep and well drained and overlies sandstone at a depth of 60 inches or more. It formed in material weathered from sandstone and in reworked eolian material.

Typically the surface layer of the Work soil is dark brown loam about 6 inches thick. The subsoil is brown clay about 33 inches thick. The substratum is very pale brown channery loam and extends to a depth of 60 inches or more.

In the Work soil, permeability is moderately slow and available water capacity is high. Effective rooting depth is 60 inches or more. Surface runoff is medium. The hazard of erosion from wind is slight and from water is moderate to high.

On the Work soil the native vegetation consists mainly of wheatgrasses, bluegrasses, bromes, big sagebrush, oakbrush, and serviceberry.

Most areas of this complex are used for grazing by livestock and wildlife and for recreational purposes.

The potential plant community on the Absarokee soil consists mainly of Gambel oak, mountain brome, nodding brome, slender wheatgrass, and elk sedge. As range condition deteriorates, mountain brome, nodding brome, slender wheatgrass, and elk sedge decrease, forbs and woody shrubs increase, and undesirable weeds and annual plants invade and become more abundant.

The potential plant community on the Work soil consists mainly of wheatgrasses, bluegrasses, and needlegrasses. As range condition deteriorates, the wheatgrasses and needlegrasses decrease, forbs and woody shrubs increase, and undesirable weeds and annual plants invade and become more abundant.

Seeding is advisable on the soils in this complex if range is in poor condition. Slender wheatgrass, bluebunch wheatgrass, western wheatgrass, and big bluegrass are suitable for seeding. Grasses that meet the seasonal requirements of livestock should be selected. Preparing a seedbed and drilling the seed help to obtain the best results. Good pasture and range management is needed to maintain the grasses. On some sites control of competing shrubs is required to improve range condition.

These soils are used for winter range by mule deer and elk. Some important plant species which can be managed for optimum production are bitterbrush, mountainmahogany, Gambel oak, serviceberry, and elk sedge. Berry-producing shrubs are used by black bear. This soil provides habitat for Merriam turkey, blue grouse, and band-tailed pigeon. In favorable years, mature Gambel oaks produce acorns, which are used by Merriam turkey.

If these soils are used for urban development, the main limitations are depth to bedrock, shrink-swell potential, and slope. If they are used for septic tank absorption fields, permeability is also a limitation. The limitations can be overcome by the use of proper design and construction methods.

These soils are in capability subclass VIe, nonirrigated.

3—Agua Fria stony loam, 3 to 12 percent slopes. This is a deep, well drained soil. It formed in cobbly and stony outwash alluvium derived from basalt and is on old terraces, mesas, and fans. Elevation ranges from 5,800 to 7,000 feet. Average annual precipitation is about 13 inches, average annual air temperature is about 47 degrees F, and the average frost-free season is about 115 days.

Typically the surface layer is brown stony loam about 2 inches thick. The subsoil is reddish brown or light brown stony clay loam about 22 inches thick. The upper part of the substratum is pink cobbly loam about 10 inches thick. The lower part, to a depth of 60 inches, is pink very cobbly loam.

Permeability is moderately slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Surface runoff is medium. The hazard of erosion from wind is slight and from water is moderate.

Included with this soil in mapping are a few small areas of Saraton, Mesa, Avalon, Cerro, and Delson soils. In some places the surface layer is free of stones or is stony clay loam. In some small areas marl is at a depth of less than 40 inches. Some areas have less clay in the subsoil. In some areas the surface layer is very stony.

The native vegetation on this soil consists mainly of big sagebrush, pinyon, and juniper (fig. 2). Western wheatgrass, Indian ricegrass, needleandthread, and Junegrass are common grasses.

About half of the acreage of this soil is used for grazing of livestock and wildlife and for recreational purposes. Some areas are in noncommercial forest and are used for limited grazing of livestock and wildlife and for recreational purposes. A small acreage is irrigated and is used for pasture, hay, and orchard crops.

This soil is suited to all of the crops commonly grown in the survey area. Shortness of the growing season may limit the choice of crops. Because of stoniness, surface clearing or rock picking may be required so that the soil can be tilled. Moisture intake rate of the surface layer is moderate and moderately slow, and the soil is easy to work if stones and cobbles are removed. This soil can be kept in continuous row crops if crop residue is used to maintain an adequate content of organic matter. Good management of irrigation water and land leveling help to conserve irrigation water and to control erosion. Minimum tillage and use of cover crops and green manure crops also help to maintain organic matter content and to control erosion.

This soil can be used for irrigated pasture and hay crops. It is well suited to smooth brome, orchardgrass, intermediate wheatgrass, alfalfa, and clover. Rock picking may be required before a suitable irrigation system can be installed. Irrigation can be done by contour ditch, corrugation, and furrow methods.

Because annual precipitation is low and has poor seasonal distribution, this soil is not suited to nonirrigated crops. Stones and cobbles on the surface interfere with cultivation. Nonirrigated pasture grasses can be planted late in summer and in fall to protect the soil from erosion and to provide limited grazing for livestock, if good pasture management is practiced. Crested wheatgrass, Russian wildrye, and pubescent wheatgrass are adapted species. Seeding of pasture may be impractical, however, because of surface stoniness.

The potential plant community in the understory consists mainly of bluebunch wheatgrass, western wheatgrass, needleandthread, Indian ricegrass, muttongrass, squirreltail, and galleta. As site conditions deteriorate, these grasses decrease, forbs and woody shrubs increase, and undesirable weeds and annual plants invade and become more abundant.

Seeding is advisable in areas that are in poor condition or have been denuded by fires, if the soil is not too stony. Western wheatgrass, bluebunch wheatgrass, Indian ricegrass, and needleandthread are suitable for seeding. Grasses that meet the seasonal requirements of livestock should be selected. Preparing a seedbed and driling the seed where possible help to obtain the best results. Seeded areas should be fenced.

This soil is suited to Utah juniper and pinyon pine. It can produce 13 cords per acre in a stand in which tree trunks have an average diameter of 5 inches at a height of one foot. The primary limitation to its use for wood crops is surface stoniness, which can hinder equipment operations.

This soil is used for winter range by mule deer. Big sagebrush, mountainmahogany, and bitterbrush are important browse species which can be managed for optimum production. In wooded areas this soil has some potential for habitat for blue grouse and band-tailed pigeon.

This soil is suited to most of the orchard crops grown in the survey area. The principal orchard crops grown on this soil are apples, peaches, cherries, and pears. Surface stoniness hinders the operation of farm machinery. Rock picking is a common practice. Frost early in spring can severely damage these crops. Cover crops are necessary to control erosion but should be managed so that they do not compete with fruit trees. Application of fertilizer promotes the best growth of trees and the production of high quality fruit. Fertilizer requirements should be based on soil or foliage analysis. An intensive spray program is generally needed to control insects and disease.

If this soil is used for urban development, the main limitations are stoniness and shrink-swell potential. If it is used for septic tank absorption fields, permeability is also a limitation. The limitations can be overcome by the use of proper design and construction methods.

This soil is in capability subclasses IVs, irrigated, and VIs, nonirrigated.

4—Agua Fria stony loam, 12 to 25 percent slopes. This is a deep, well drained soil. It formed in cobbly and stony outwash alluvium derived from basalt and is on old, high terraces, mesas, and fans. Elevation ranges from 5,800 to 7,000 feet. Average annual precipitation is about 13 inches, average annual air temperature is about 47 degrees F, and the average frost-free season is about 115 days.

Typically the surface layer is brown stony loam about 2 inches thick. The subsoil is reddish brown or light brown stony clay loam about 22 inches thick. The upper part of the substratum is pink cobbly loam about 10 inches thick, and the lower part, to a depth of 60 inches or more, is pink very cobbly loam.

Permeability is moderately slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Surface runoff is rapid. The hazard of erosion from wind is slight and from water is moderate to high.

Included with this soil in mapping are a few small areas of Saraton, Mesa, Avalon, Cerro, and Delson soils. In some places the surface layer is free of stones or is stony clay loam, marl is at a depth of less than 40 inches, or less clay is in the subsoil.

The native vegetation on this soil consists mainly of big sagebrush, pinyon, and juniper. Western wheatgrass, Indian ricegrass, needleandthread, and squirreltail are common grasses.

Most areas of this soil are in noncommercial forest and are used for limited grazing of livestock and wildlife and for recreational purposes.

Because of surface stoniness and slope, this soil is unsuited to crops. Preparation and drilling of seed for pasture plantings on depleted native range or in cleared areas are generally not practical because of surface stoniness. A limited degree of success can be expected by broadcasting seed late in summer or early in fall. Pubescent wheatgrass, western wheatgrass, Indian ricegrass, and created wheatgrass are adapted species. Good pasture management must be practiced to protect the soil from erosion and to provide grazing for livestock.

This soil is suited to Utah juniper and pinyon pine. It can produce 13 cords per acre in a stand in which the tree trunks have an average diameter of 5 inches at a height of one foot. The main limitation to its use for wood crops is surface stoniness, which can hinder equipment operations.

This soil is used for winter range by mule deer. Important species for winter forage include big sagebrush, mountainmahogany, and bitterbrush. This soil has limited potential for habitat for blue grouse. Encouragement of

pinyon and juniper on suitable sites can lead to establishment of a browse-grass plant community beneficial to livestock and mule deer. The cover provided by pinyon and juniper is a vital habitat requirement of mule deer, and maintaining this cover should be considered in management.

This soil is suited to most of the orchard crops grown in the survey area. The principal orchard crops grown on this soil are apples, peaches, cherries, and pears. Surface stoniness hinders operation of farm machinery. Rock picking is a common practice. Frost early in spring can severely damage these crops. Cover crops are necessary to control erosion but should be managed so that they do not compete with fruit trees. Application of fertilizer promotes the best growth of trees and the production of high quality fruit. Fertilizer requirements should be based on soil or foliage analysis. An intensive spray program is generally needed to control insects and disease. Estimated average yields per acre for some orchard crops are as follows: apples, 700 bushels; peaches, 500 bushels; cherries, 700 bushels; and pears, 550 bushels.

If this soil is used for urban development, the main limitations are stoniness, shrink-swell potential, and slope. These limitations can be overcome by the use of proper design and construction methods.

This soil is in capability subclass VIs, irrigated and nonirrigated.

5—Agua Fria clay loam, 1 to 6 percent slopes. This is a deep, well drained soil. It formed in cobbly and stony outwash alluvium derived from basalt and is on high terraces, mesas, and fans. Elevation ranges from 5,800 to 7,000 feet. Average annual precipitation is about 13 inches, average annual air temperature is about 47 degrees F, and the average frost-free season is about 115 days.

Typically the surface layer is brown clay loam about 2 inches thick. The subsoil is reddish brown stony clay loam about 22 inches thick. The upper part of the substratum is pink cobbly loam about 10 inches thick. The lower part, to a depth of 60 inches or more, is pink very cobbly loam.

Permeability is moderately slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Surface runoff is medium. The hazard of erosion from wind is slight and from water is moderate.

Included with this soil in mapping are a few small areas of Saraton, Mesa, Avalon, Cerro, and Delson soils. In some areas the soil is cobbly or stony or has less clay in the subsoil. In some small areas marl is above a depth of 40 inches.

The native vegetation on this soil consists mainly of big sagebrush, pinyon, and juniper. Western wheatgrass, Indian ricegrass, needleandthread, and Junegrass are common grasses.

Most areas of this soil are used for irrigated crops, mainly alfalfa, small grains, corn for silage, hay, and pasture. Some areas are used for orchard crops.

This soil is suited to all of the crops commonly grown in the survey area. Shortness of the growing season may limit yields and the choice of crops. Extreme care is necessary to prevent water erosion. Maintaining organic matter content is important. The soil should be kept in grasses, legumes, or close-growing crops at least one-fourth of the time, and row crops in rotation should be grown no more than 3 years consecutively. Use of the crop residue, land leveling, good management of irrigation water, and using cover crops and green manure crops help to maintain organic matter content and to control erosion.

This soil can be used for irrigated pasture and hay crops. It is well suited to alfalfa, smooth brome, orchardgrass, intermediate wheatgrass, and clover. Irrigation can be done by contour ditch, corrugation, and furrow methods.

Because annual precipitation is low and has poor seasonal distribution, this soil is not suited to nonirrigated crops. However, nonirrigated pasture grasses can be planted late in summer and in fall. Good pasture management must be practiced to protect the soil from erosion and to provide grazing for livestock. Crested wheatgrass, pubescent wheatgrass, and Russian wildrye are adapted species.

The potential plant community on this soil consists mainly of bluebunch wheatgrass, Junegrass, western wheatgrass, Indian ricegrass, galeta, needleandthread, and squirreltail. As range condition deteriorates, the wheatgrasses, Indian ricegrass, Junegrass, and needleandthread decrease, forbs and woody shrubs increase, and undesirable weeds and annual plants invade and become more abundant.

Seeding is advisable if range is in poor condition. Western wheatgrass, bluebunch wheatgrass, Indian ricegrass, and needleandthread are suitable for seeding. Grasses that meet the seasonal requirements of livestock should be selected. Preparing a seedbed and drilling the seed help to obtain the best results. Seeded areas should be fenced.

This soil is suited to Utah juniper and pinyon pine. It can produce 13 cords per acre in a stand in which the tree trunks have an average diameter of 5 inches at a height of one foot.

This soil is used for winter range by mule deer. Big sagebrush, mountainmahogany, and bitterbrush are important browse species which can be managed for optimum production.

This soil is suited to most of the orchard crops grown in the survey area. The principal orchard crops grown on this soil are apples, peaches, cherries, and pears. Frost early in spring can severely damage these crops. Cover crops are necessary to control erosion but should be managed so that they do not compete with fruit trees.

Application of fertilizer promotes the best growth of trees and the production of high quality fruit. Fertilizer requirements should be based on soil or foliage analysis. An intensive spray program is generally needed to control insects and disease. Estimated average yields per acre for some orchard crops are as follows: apples, 800 bushels; peaches, 600 bushels; cherries, 800 bushels; and pears, 600 bushels.

If this soil is used for urban development, the main limitation is shrink-swell potential. If it is used for septic tank absorption fields, permeability is also a limitation. The limitations can be overcome by the use of proper design and construction methods.

This soil is in capability subclasses IIIe, irrigated, and VIe, nonirrigated.

6—Apishapa silty clay loam, 0 to 5 percent slopes. This is a deep, poorly drained and somewhat poorly drained soil. It formed in fine textured alluvium and is on flood plains, terraces, and alluvial fans. Elevation ranges from 5,800 to 7,000 feet. Average annual precipitation is about 12 inches, average annual air temperature is about 48 degrees F, and the average frost-free season is about 120 days.

Typically the surface layer is light olive gray silty clay loam about 9 inches thick. The upper 14 inches of the underlying material is grayish brown heavy silty clay loam that has common, distinct, brown and yellowish brown mottles. To a depth of 60 inches, the underlying material is dark gray heavy silty clay loam that has common, prominent, yellowish brown and strong brown mottles.

Permeability is slow, and available water capacity is high. Effective rooting depth is about 10 to 30 inches and is restricted by a high water table. Surface runoff is medium. The hazard of erosion from wind is slight and from water is moderate to high. The water table is within a depth of 3 feet.

Included with this soil in mapping are a few small areas of Colona, Billings, Razor, and Gaynor soils and some areas of Fluvaquents. In some areas the surface layer is silty clay, and in some small areas gravel and cobbles are on the surface.

Gullies that are 20 feet deep and 40 feet wide are common and drain some areas. Some areas are artificially drained.

The native vegetation on this soil consists mainly of four-wing saltbush, greasewood, western wheatgrass, sedges, rushes, and saltgrass.

Most areas of this soil are used for irrigated crops, mainly hay and pasture. Some areas are used for small grains.

If this soil is drained, it is suited to all of the crops commonly grown in the survey area. Shortness of the growing season and seepage may limit the choice of crops. Care is necessary to prevent water erosion. This soil should be kept in grasses, legumes, or close-growing crops at least one-fourth of the time, and row crops in rotation should be grown no more than 3 years consecutively. Use of crop residue, installation of artificial drainage, good management of irrigation water, and reduction of toxic salt in the soil help to maintain organic matter content, prevent salt and water accumulation, and control erosion. Because of slow permeability, artificial drainage is difficult. Land leveling and using green manure crops, grasses, and legumes in rotation help to maintain organic matter content, control erosion, and prevent seepage.

This soil can be used for irrigated pasture and hay crops. It is well suited to clover, smooth brome, orchardgrass, tall wheatgrass, and intermediate wheatgrass. Irrigation can be done by contour ditch, corrugation, and furrow methods.

Because annual precipitation is low and has poor seasonal distribution, this soil is not suited to nonirrigated crops. However, nonirrigated pasture grasses can be planted late in summer and in fall to protect the soil from erosion and to provide grazing for livestock, if proper pasture management is practiced. Tall wheatgrass, pubescent wheatgrass, Russian wildrye, and hard fescue are adapted species.

The potential plant community on this soil consists mainly of western wheatgrass and basin wildrye. As range condition deteriorates, western wheatgrass decreases, forbs and woody shrubs increase, and undesirable weeds and annual plants invade and become more abundant.

Seeding is advisable if range is in poor condidtion. Western wheatgrass, basin wildrye, and slender wheatgrass are suitable for seeding. Grasses that meet the seasonal requirements of livestock should be selected. Preparing a seedbed and drilling the seed help to obtain the best results. On some sites, control of competing shrubs is required to improve range condition. Fencing of range is needed, because this soil is more productive and is in a lower position than adjacent soils and because the stockwater supply for adjacent soils generally is located on this soil. Stockwater developments may be required.

This soil is in productive low-lying areas that receive additional moisture from adjacent soils on uplands. It is used for winter range by mule deer and has potential for development of shrub plantings and food plots for wildlife.

If this soil is used for urban development, the main limitations are a high water table, hazard of flooding, and shrink-swell potential. If this soil is used for septic tank absorption fields, permeability is also a limitation. The limitations can be overcome by the use of proper design and construction methods.

This soil is in capability subclasses IVw, irrigated, and VIw, nonirrigated.

7—Aquic Natrargids, saline. This broadly defined unit consists of somewhat poorly drained to very poorly drained, strongly saline and alkali soils. These soils are in low, concave areas, in old oxbows along streams, and

on nearly level to strongly sloping alluvial fans. Slopes range from 0 to 6 percent. These soils vary widely in texture and in the degrees of mottling and gleying. The water table fluctuates.

These soils range from medium textured to fine textured and commonly formed over impermeable shale. The surface layer is salt crusted, fluffy, strongly alkaline, and calcareous. The underlying layers are massive, are stained with yellowish brown streaks, or are strongly gleyed because of poor aeration. Although the water table fluctuates, it is generally at or near the surface during part of the year.

The native vegetation consists mainly of alkali sacaton, rushes, and other salt-tolerant grasses. Some areas are barren because of the strongly alkaline surface layer. Reclamation of these soils commonly is difficult or impractical. The soils are used for wildlife habitat, recreational purposes, and limited grazing.

If these soils are used for urban development, the main limitation is the high water table. This limitation can be overcome by the use of proper design and construction methods.

This soil is in capability subclass VIIw, nonirrigated.

8—Ascalon sandy loam, 3 to 10 percent slopes. This is a deep, well drained soil. It formed in alluvium and colluvium derived from sandstone and is on uplands and fans. Elevation ranges from 5,800 to 7,000 feet. Average annual precipitation is about 14 inches, average annual air temperature is about 46 degrees F, and the average frost-free season is about 120 days.

Typically the surface layer is grayish brown sandy loam about 8 inches thick. The subsoil is brown or light yellowish brown sandy clay loam about 26 inches thick. The substratum, to a depth of 60 inches, is pale yellow sandy loam.

Permeability is moderate, and available water capacity is high. Effective rooting depth is 60 inches or more. Surface runoff is medium. The hazard of erosion from wind is slight to moderate and from water is moderate to high.

Included with this soil in mapping are a few small areas of Mesa, Avalon, Kech, and Progresso soils. The surface layer is sandy clay loam or light clay loam in some areas.

The native vegetation on this soil consists mainly of big sagebrush, Junegrass, Indian ricegrass, needleandthread, and scattered pinyon and juniper.

Some areas of this soil are used for irrigated crops, mainly hay, pasture, small grains, and orchard crops. Some areas are used for grazing of livestock and wildlife and for recreational purposes.

This soil is suited to all of the crops commonly grown in the survey area. Shortness of the growing season may limit yields and the choice of crops. Extreme care is needed to prevent wind and water erosion. Maintaining organic matter content is important. The soil can be used for continuous row crops, or it can be used for close-growing crops about one-fourth of the time. Use of green manure crops, use of crop residue, good management of irrigation water, using grasses and legumes in rotation, land leveling, and minimum tillage help to maintain organic matter content and to control erosion.

This soil can be used for irrigated pasture and hay crops. It is suited to alfalfa, smooth brome, orchardgrass, intermediate wheatgrass, and clover. Irrigation can be done by contour ditch, corrugation, and furrow methods.

Because annual precipitation is low and has poor seasonal distribution, this soil is not suited to nonirrigated crops. However, nonirrigated pasture grasses can be planted late in summer and in fall to protect the soil from erosion and to provide grazing for livestock, if good pasture management is practiced. Crested wheatgrass, Russian wildrye, and pubescent wheatgrass are adapted species.

The potential plant community on this soil consists mainly of bluebunch wheatgrass, Junegrass, western wheatgrass, Indian ricegrass, galleta, needleandthread, and squirreltail. As range condition deteriorates, wheatgrasses, Indian ricegrass, Junegrass, and needleandthread decrease, forbs and woody shrubs increase, and undesirable weeds and annual plants invade and become more abundant.

Seeding is advisable if range is in poor condition. Western wheatgrass, bluebunch wheatgrass, Indian ricegrass, and needleandthread are suitable for seeding. Grasses that meet the seasonal requirements of livestock should be selected. Preparing a seedbed and drilling the seed help to obtain the best results. Seeded areas should be fenced.

This soil is used for winter range by mule deer. Big sagebrush, mountainmahogany, and bitterbrush are important browse species which can be managed for optimum production.

This soil is well suited to most of the orchard crops grown in the survey area. The principal orchard crops grown on this soil are apples, pears, peaches, and cherries. Where air drainage is poor, frost can severely damage fruit crops in spring. Cover crops are necessary to control erosion but should be managed so that they do not compete with trees. Application of fertilizer promotes the best growth of trees and the production of high quality fruit. Fertilizer requirements should be based on soil or foliage analysis. An intensive spray program is generally needed to control insects and disease. Estimated average yields per acre for some orchard crops are as follows: apples, 850 bushels; peaches, 650 bushels; cherries, 850 bushels; and pears, 600 bushels.

If this soil is used for urban development, the main limitation is low strength. This limitation can be overcome by the use of proper design and construction methods.

This soil is in capability subclasses IVe, irrigated, and VIe, nonirrigated.

9—Avalon loam, 0 to 3 percent slopes. This is a deep, well drained soil. It formed in calcareous eolian

material reworked with basaltic alluvium and is on old terraces, mesas, and valley foot slopes. Elevation ranges from 4,800 to 6,000 feet. Average annual precipitation is about 10 inches, average annual air temperature is about 50 degrees F, and the average frost-free season is about 135 days.

Typically the surface layer is light brown loam about 9 inches thick. The subsoil is pink loam about 7 inches thick. The substratum, to a depth of 60 inches, is light brown or pink loam.

Permeability is moderate, and available water capacity is high. Effective rooting depth is 60 inches or more. Surface runoff is slow. The hazard of erosion from wind is slight to moderate and from water is moderate.

Included with this soil in mapping are a few small areas of Mesa, Utaline, and Meeteetse soils. In some areas, the surface layer is light clay loam or loam or cobbles and stones are in the underlying material.

The native vegetation on this soil consists mainly of shadscale, fourwing saltbush, big sagebrush, galleta, western wheatgrass, and Indian ricegrass.

Most areas of this soil are irrigated and are used for row crops, small grains, pasture, and orchard crops. Some areas are used for grazing, wildlife habitat, and recreational purposes.

This soil is suited to all of the crops commonly grown in the survey area. Length of the growing season does not limit the choice of crops. Moisture intake rate is high, and the soil is easy to work. Care is needed to prevent wind and water erosion. The soil can be kept in continuous row crops if crop residue is used to maintain an adequate content of organic matter, and if good management of irrigation water and land leveling are used to conserve irrigation water and to control erosion. Minimum tillage and use of green manure crops also help to maintain the content of organic matter and to control erosion.

This soil can be used for irrigated pasture and hay crops. It is well suited to smooth brome, orchardgrass, intermediate wheatgrass, alfalfa, and clover. Irrigation can be done by contour ditch, corrugation, and furrow methods.

Because annual precipitation is low and has poor seasonal distribution, nonirrigated pasture grasses can be planted late in summer and in fall to protect the soil from erosion and to provide grazing for livestock, if proper pasture management is practiced. Siberian wheatgrass, Russian wildrye, and crested wheatgrass are adapted species.

The potential plant community on this soil consists mainly of galleta, Indian ricegrass, Gardner saltbush, and shadscale. As range condition deteriorates, galleta and Indian ricegrass decrease, forbs and woody shrubs increase, and undesirable weeds and annual plants invade and become more abundant.

Seeding is advisable if range is in poor condition. Best results can be expected from sand dropseed, Indian ricegrass, and thickspike wheatgrass. Irrigation may be required in newly seeded areas until the plants are established. Preparing a seedbed and drilling the seed help to obtain the best results. Grasses that meet the seasonal requirements of livestock should be selected. Seeded areas should be fenced.

The soil provides habitat for pronghorn antelope, desert cottontail, and mourning dove. Where water is available, water developments and food plots can be used to improve wildlife habitat. If this soil is used for irrigated crops, use of a conservation cropping system that includes grain crops improves habitat for ring-necked pheasant. A food supply and nesting cover are important habitat elements required by pheasant.

This soil is well suited to most of the orchard crops grown in the survey area. The principal orchard crops grown on this soil are apples, peaches, cherries, and pears. Cover crops are necessary to prevent erosion but should be managed so that they do not compete with fruit trees. Application of fertilizer promotes the best growth of trees and the production of high quality fruit. Fertilizer requirements should be based on soil or foliage analysis. An intensive spray program is generally needed to control insects and disease. Estimated average yields per acre for orchard crops are as follows: apples, 850 bushels; peaches, 650 bushels; cherries, 850 bushels; and pears, 600 bushels.

If this soil is used for urban development, the main limitation is corrosivity. If it is used for septic tank absorption fields, permeability is the main limitation. The limitations can be overcome by the use of proper design and construction methods.

This soil is in capability subclasses IIe, irrigated, and VIIe, nonirrigated.

10—Avalon loam, 3 to 6 percent slopes. This is a deep, well drained soil. It formed in calcareous eolian material reworked with basaltic alluvium and is on old terraces, mesas, and valley foot slopes. Elevation ranges from 4,800 to 6,000 feet. Average annual precipitation is about 10 inches, average annual air temperature is about 50 degrees F, and the average frost-free season is about 135 days.

Typically the surface layer is light brown loam about 9 inches thick. The subsoil is pink loam about 7 inches thick. The substratum, to a depth of 60 inches, is light brown or pink loam.

Permeability is moderate, and available water capacity is high. Effective rooting depth is 60 inches or more. Surface runoff is moderate. The hazard of erosion from wind is slight to moderate and from water is high.

Included with this soil in mapping are a few small areas of Mesa, Utaline, and Meeteetse soils. In some areas the surface layer is loam or light clay loam.

The native vegetation on this soil consists mainly of shadscale, fourwing saltbush, big sagebrush, galleta, western wheatgrass, and Indian ricegrass.

About half of the acreage of this soil is used for grazing of livestock and wildlife and for recreational purposes. The rest is used for irrigated crops, mainly row crops, small grains, pasture, and orchard crops.

This soil is suitable for all of the crops commonly grown in the survey area. Length of the growing season does not limit the choice of crops. Moisture intake rate is high, and the surface layer is easy to work. The soil can be kept in continuous row crops, or it can be planted to close-growing crops, grasses, or legumes about one-fourth of the time. Use of crop residue, land leveling, and good management of irrigation water help to conserve irrigation water, maintain organic matter content, and control erosion. Using green manure crops, rotation of grasses and legumes, and minimum tillage also help to maintain organic matter content and to reduce loss of moisture.

This soil can be used for irrigated pasture and hay crops. It is well suited to orchardgrass, intermediate wheatgrass, alfalfa, and clover. Irrigation can be done by contour ditch and corrugation methods.

Because annual precipitation is low and has poor seasonal distribution, this soil is not suited to nonirrigated crops. However, nonirrigated pasture grasses can be planted late in summer and in fall to protect the soil from erosion and to provide grazing for livestock. Siberian wheatgrass, Russian wildrye, and crested wheatgrass are adapted species.

The potential plant community on this soil consists mainly of galleta, Indian ricegrass, Gardner saltbush, and shadscale. As range condition deteriorates, galleta and Indian ricegrass decrease, forbs and woody shrubs increase, and undesirable weeds and annual plants invade and become more abundant.

Seeding is advisable if range is in poor condition. Best results can be expected from sand dropseed, Indian ricegrass, and thickspike wheatgrass. Irrigation may be required in newly seeded areas until the plants are established. Preparing a seedbed and drilling the seed help to obtain the best results. Grasses should be selected that meet the seasonal requirements of livestock. Seeded areas should be fenced.

This soil provides habitat for pronghorn antelope, desert cottontail, and mourning dove. Where water is available, water developments and food plots can be used to improve wildlife habitat. If this soil is used for irrigated crops; a conservation cropping system that includes grain crops improves habitat for ring-necked pheasant. A food supply and nesting cover are important habitat elements required by pheasant.

This soil is well suited to most of the orchard crops grown in the survey area. The principal orchard crops grown on this soil are apples, peaches, cherries, and pears. Cover crops are necessary to prevent erosion but should be managed so that they do not compete with fruit trees. Application of fertilizer promotes the best growth of trees and the production of high quality fruit. Fertilizer requirements should be based on soil or foliage analysis. An intensive spray program is generally needed to control insects and disease. Estimated average yields per acre for orchard crops are as follows: apples, 800 bushels; peaches, 600 bushels; cherries, 800 bushels; and pears, 550 bushels.

If this soil is used for urban development, the main limitation is corrosivity. If it is used for septic tank absorption fields, permeability is the main limitation. The limitations can be overcome by the use of proper design and construction methods.

This soil is in capability subclasses IIIe, irrigated, and VIIe, nonirrigated.

11—Badland. This broadly defined unit is a miscellaneous area consisting of barren or nearly barren outcrops of silty, calcareous, and gypsiferous shale interspersed with areas of deeper soil material. The landscape consists of rolling uplands and very steep hillsides and is dissected by narrow valleys and gullies. Slopes range from 10 to 70 percent. The degree of weathering of the shale varies.

Included with this unit in mapping are Billings soils in valleys and drainageways and Chipeta and Persayo soils on some upland slopes. Steep valley side slopes that commonly are covered with basaltic stone are also included.

Badland is nearly impermeable, and surface runoff is rapid. Areas are eroding; consequently, heavy rains are followed by flash floods. Runoff water transports silt and causes sedimentation on adjacent soils and in areas downstream.

Badland supports little vegetation and has only limited value for grazing. It is better suited to recreational purposes and wildlife habitat than to other uses.

If Badland is used for urban development, the main limitation is slope. This limitation is difficult or impractical to overcome.

This unit is in capability unit VIIIe.

12—Beenom-Absarokee loams, 5 to 20 percent slopes. The sloping to moderately steep soils are on uplands and mountain side slopes. Elevation ranges from 6,800 to 8,300 feet. Average annual precipitation is about 17 inches, average annual air temperature is about 43 degrees F, and the average frost-free season is about 100 days.

The Beenom soil makes up about 40 percent of this complex and is on the upper part of the slopes and on small ridgetops. The Absarokee soil makes up about 40 percent of this complex. It is in positions downslope from the Beenom soil and is also in small depressions.

Included with these soils in mapping are a few small areas of Kech, Progresso, and Work soils and outcrops of sandstone. Included areas make up 20 percent of the complex. In some places the surface layer is sandy loam or clay loam or is channery or stony.

The Beenom soil is shallow and well drained and overlies bedrock at a depth of 10 to 20 inches. It formed in

material that was weathered in place from sandstone and interbedded shale.

Typically the surface layer of the Beenom soil is grayish brown loam about 4 inches thick. The subsoil is dark brown clay loam about 5 inches thick. The substratum is very pale brown channery loam. Sandstone is at a depth of about 14 inches.

In the Beenom soil, permeability is moderate and available water capacity is low. Effective rooting depth is about 14 inches. Surface runoff is medium to rapid. The hazard of erosion from wind is slight and from water is moderate to high.

On the Beenom soil the native vegetation consists mainly of Gambel oak, serviceberry, and big sagebrush. Wheatgrasses, pine needlegrass, and needleandthread are common grasses.

The Absarokee soil is moderately deep and well drained and overlies bedrock at a depth of 20 to 40 inches. It formed in locally transported sediment derived from sandstone and interbedded shale.

Typically the surface layer of the Absarokee soil is dark grayish brown loam about 7 inches thick. The subsoil is brown clay about 18 inches thick. The substratum is light brown channery clay loam. Sandstone is at a depth of about 30 inches.

In the Absarokee soil, permeability is moderately slow and available water capacity is moderate. Effective rooting depth is about 30 inches. Surface runoff is medium to rapid. The hazard of erosion from wind is slight and from water is moderate to high.

On the Absarokee soil the native vegetation consists mainly of Gambel oak, serviceberry, big sagebrush, and snowberry. Wheatgrasses, pine dropseed, needlegrass, and needleandthread are common grasses.

Most areas of this complex are in native vegetation and are used for limited grazing by livestock and wildlife and for recreational purposes.

The potential plant community on the Beenom soil consists mainly of bluebunch wheatgrass and other wheatgrasses, muttongrass, and Junegrass. As range condition deteriorates, the wheatgrasses, muttongrass, and Junegrass decrease, forbs and woody shrubs increase, and undesirable weeds and annual plants invade and become more abundant.

The potential plant community on the Absarokee soil consists mainly of Gambel oak, mountain brome, nodding brome, slender wheatgrass, and elk sedge. As range condition deteriorates, mountain brome, nodding brome, slender wheatgrass, and elk sedge decrease, forbs and woody shrubs increase, and undesirable weeds and annual plants invade and become more abundant.

Seeding is advisable if range is in poor condition. Steep slopes and surface stoniness are limitations in some areas. Slender wheatgrass, western wheatgrass, and bluebunch wheatgrass are suitable for seeding. Grasses that meet the seasonal requirements of livestock should be selected. Where soil properties are favorable, preparing a seedbed and drilling the seed help to obtain the best results. Good pasture and range management is needed to maintain the grasses. On some sites, control of competing shrubs is required to improve range condition.

These soils are used for winter range by mule deer and elk. Some important plant species which can be managed for optimum production are bitterbrush, mountainmahogany, Gambel oak, serviceberry, and elk sedge. Berry-producing shrubs are used by black bear. Areas of this soil provide habitat for Merriam turkey, blue grouse, and band-tailed pigeon. In favorable years mature Gambel oaks produce acorns, which are used by Merriam turkey.

If these soils are used for urban development, the main limitations are depth to bedrock, shrink-swell potential, and slope. If they are used for septic tank absorption fields, permeability is also a limitation. The limitations can be overcome by proper design and construction methods.

These soils are in capability subclass VIe, nonirrigated.

13—Beenom-Absarokee association, 20 to 60 percent slopes. These hilly, steep, and very steep soils are on mountain side slopes. Elevation ranges from 6,800 to 8,300 feet. Average annual precipitation is about 17 inches, average annual air temperature is about 43 degrees F, and the average frost-free season is about 100 days.

The Beenom soil makes up about 50 percent of the association. It is on the upper part of the slope and on ridgetops. The Absarokee soil makes up about 30 percent of the association. It is in a position lower on the slope than the Beenom soil and is also in swales.

Included with these soils in mapping are a few small areas of Kech, Progresso, and Work soils. Also included are rock outcrops, very shallow soils, and deep, stony soils. Included areas make up 20 percent of the association. In some small areas the surface layer is clay loam or sandy loam.

The Beenom soil is shallow and well drained and overlies bedrock at a depth of 10 to 20 inches. It formed in material that was weathered in place from sandstone and interbedded shale.

Typically the surface layer of the Beenom soil is grayish brown loam about 4 inches thick. The subsoil is dark brown clay loam about 5 inches thick. The substratum is very pale brown channery loam. Sandstone is at a depth of about 14 inches.

In the Beenom soil, permeability is moderate and available water capacity is low. Effective rooting depth is about 14 inches. Surface runoff is rapid. The hazard of erosion from wind is slight and from water is high.

On the Beenom soil the native vegetation consists mainly of Gambel oak, serviceberry, big sagebrush, and snowberry. Wheatgrasses, pine needlegrass, and needleandthread are common grasses.

The potential plant community on the Beenom soil consists mainly of bluebunch wheatgrass and other wheatgrasses, muttongrass, and Junegrass. As range condition deteriorates, the wheatgrasses, muttongrass, and Junegrass decrease, forbs and woody shrubs increase, and undesirable weeds and annual plants invade and become more abundant.

Seeding can be done on the Beenom soil if range is in poor condition, but steep slopes and surface stoniness are limitations. Western wheatgrass and bluebunch wheatgrass are suitable for seeding. Grasses that meet the seasonal requirements of livestock should be selected. Preparing a seedbed and drilling the seed, where possible, help to obtain the best results. Seeded areas should be fenced.

The Beenom soil is used for winter range by mule deer. At the high elevations it is used for winter range by elk. Some important plant species which can be managed for optimum production are big sagebrush, bitterbrush, serviceberry, low rabbitbrush, and wild rose.

If the Beenom soil is used for urban development, the main limitations are slope, depth to bedrock, and shrink-swell potential. If it is used for septic tank absorption fields, permeability is also a limitation. The limitations can be overcome by the use of proper design and construction methods.

The Absarokee soil is well drained and overlies bedrock at a depth of 20 to 40 inches. It formed in locally transported sediment derived from sandstone and interbedded shale.

Typically the surface layer of the Absarokee soil is dark grayish brown loam about 7 inches thick. The subsoil is brown clay about 18 inches thick. The substratum is light brown channery clay loam. Sandstone is at a depth of about 30 inches.

In the Absarokee soil, permeability is moderately slow and available water capacity is low. Effective rooting depth is about 30 inches. Surface runoff is rapid. The hazard of erosion from wind is slight and from water is moderate to high.

On the Absarokee soil the native vegetation consists mainly of Gambel oak, serviceberry, big sagebrush, and snowberry. Wheatgrasses, pine dropseed, needlegrasses, brome, and needleandthread are common grasses.

Most areas of this association are used for grazing by livestock and wildlife and for recreational purposes.

Because of steepness of slope, the Absarokee soil is unsuited to crops and reseeding of depleted or burned areas in native vegetation is not feasible by conventional methods. A fair degree of success can be expected by broadcasting seed for nonirrigated plantings of grasses in spring or fall. Smooth brome, pubescent wheatgrass, and crested wheatgrass are adapted species. Good pasture management should be practiced to maintain the grasses.

The potential plant community on the Absarokee soil consists mainly of Gambel oak, mountain brome, nodding brome, slender wheatgrass, and elk sedge. As range condition deteriorates, mountain brome, nodding brome, slender wheatgrass, and elk sedge decrease, forbs and woody shrubs increase, and undesirable weeds and annual plants invade and become more abundant.

Seeding is advisable on the Absarokee soil if range is in poor condition. Slender wheatgrass and western wheatgrass are suitable for seeding. Grasses that meet the seasonal requirements of livestock should be selected. Where possible, preparing a seedbed and drilling the seed help to obtain the best results.

On some sites, control of competing shrubs is required to improve range condition. Seeded or brushed areas should be fenced.

The Absarokee soil is used for winter range by mule deer and elk. Some important plant species which can be managed for optimum production are bitterbrush, mountainmahogany, Gambel oak, serviceberry, and elk sedge. Berry-producing shrubs are an important habitat element for black bear. This soil provides habitat for Merriam turkey, blue grouse, and band-tailed pigeon. In favorable years mature Gambel oaks produce acorns, which are used by Merriam turkey.

If the Absarokee soil is used for urban development, the main limitations are depth to bedrock and slope. If this soil is used for septic tank absorption fields, permeability is also a limitation. The limitations can be overcome by the use of proper design and construction methods.

This association is in capability subclass VIIe, nonirrigated.

14—Billings silty clay loam, 0 to 3 percent slopes. This is a deep, well drained soil. It formed in silty alluvium and is on fans and flood plains. Elevation ranges from 4,500 to 6,500 feet. Average annual precipitation is about 10 inches, average annual air temperature is about 50 degrees F, and the average frost-free season is about 150 days.

Typically the surface layer is light brownish gray silty clay loam about 4 inches thick. The underlying material, to a depth of 60 inches, is light brownish gray, stratified silty clay loam and clay loam.

Permeability is slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Surface runoff is medium. The hazard of erosion from wind and water is moderate.

Included with this soil in mapping are a few small areas of Chipeta, Persayo, and Killpack soils. Also included are areas of Aquic Natrargids and Gullied land. In some areas the surface layer is silty clay or silt loam.

The native vegetation on this soil consists mainly of greasewood, shadscale, fourwing saltbush, and galleta.

Most areas of this soil are used for irrigated crops, mainly row crops, small grains, hay, and pasture.

This soil is suited to all of the crops commonly grown in the survey. Length of the growing season does not limit the choice of crops. Care is needed to prevent water erosion. The soil can be kept in continuous row crops if crop residue is used to maintain an adequate content of organic matter, and if good management of irrigation water and land leveling are used to control erosion. Minimum tillage and the use of cover crops and green manure crops also help to maintain content of organic matter and to control erosion.

This soil can be used for irrigated pasture and hay crops. It is well suited to brome, orchardgrass, tall wheatgrass, alfalfa, and clover. Irrigation can be done by contour ditch, corrugation, and furrow methods.

Because annual precipitation is low and has poor seasonal distribution, this soil is not suited to nonirrigated crops. However, nonirrigated pasture grasses can be planted late in summer and in fall to protect the soil from erosion and to provide grazing for livestock, if good pasture management is practiced. Siberian wheatgrass, Russian wildrye, and tall wheatgrass are adapted species.

The potential plant community on this soil consists mainly of saltgrass, alkali sacaton, galleta, western wheatgrass, fourwing saltbush, and greasewood. As range condition deteriorates, alkali sacaton, galleta, western wheatgrass, and fourwing saltbush decrease, forbs and other woody shrubs increase, and undesirable weeds and annual plants invade and become more abundant.

Seeding has a limited chance of success but may be advisable if range is in poor condition. Best results can be expected from sand dropseed and western wheatgrass. Irrigation may be required in newly seeded areas until the plants are established. Preparing seedbed and drilling the seed help to obtain the best results. Grasses that meet the seasonal requirements of livestock should be selected. Seeded areas should be fenced.

Small included areas of poorly drained soils in this map unit have potential for development for wetland wildlife habitat. Open water areas can be developed by blasting or by use of heavy equipment to provide nesting cover for waterfowl and shorebirds. Inland saltgrass, an important source of food for waterfowl, occurs naturally in these poorly drained areas.

This soil is suited to most of the orchard crops grown in the survey area. The principal orchard crops grown on the soil are apples, pears, cherries, and peaches. Salinity and alkalinity may hinder tree growth and production of fruit. In areas where air drainage is poor, fruit crops can be seriously damaged by frost in spring. Cover crops are necessary to control erosion but should be managed so that they do not compete with fruit trees. Application of fertilizer promotes the best growth of trees and the production of fruit. Fertilizer requirements should be based on soil or foliage analysis. An intensive spray program is generally needed to control insects and disease. Estimated average yields per acre for orchard crops are as follows: apples, 700 bushels; peaches, 550 bushels; cherries, 700 bushels; and pears, 550 bushels.

If this soil is used for urban development, the main limitations are shrink-swell potential, corrosivity, and low strength. If it is used for septic tank absorption fields, permeability is the main limitation. The limitations can be overcome by the use of proper design and construction methods.

This soil is in capability subclasses IIe, irrigated, and VIIe, nonirrigated.

15—Billings silty clay loam, 3 to 6 percent slopes. This is a deep, well drained soil. It formed in silty alluvium and is on fans and flood plains. Elevation ranges from 4,500 to 6,500 feet. Average annual precipitation is about 10 inches, average annual air temperature is about 50 degrees F, and the average frost-free season is about 150 days.

Typically the surface layer is light brownish gray silty clay loam about 4 inches thick. The underlying material, to a depth of 60 inches, is light brownish gray stratified silty clay loam and clay loam.

Permeability is slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Surface runoff is rapid. The hazard of erosion from wind is moderate and from water is high.

Included with this soil in mapping are a few small areas of Chipeta, Persayo, and Killpack soils. Also included are some areas of Aquic Natrargids and Gullied land. In some areas the surface layer is silty clay or silt loam. Also included are areas that have stones on the surface and in the underlying layers; these areas commonly are on the upper part of fans and flood plains.

The native vegetation on this soil consists mainly of greasewood, shadscale, fourwing saltbush, and galleta.

Most areas of this soil are used for irrigated crops, mainly row crops, small grains, hay, and pasture.

This soil is suited to almost all of the crops commonly grown in the survey area. Length of the growing season does not limit the choice of crops. Moisture intake rate is slow, and the soil should be worked at the proper moisture content. Special care is needed to prevent water erosion. Maintaining organic matter content is important. The soil should be kept in legumes, grasses, or close-growing crops at least one-fourth of the time. Row crops can be grown about 3 years consecutively. Land leveling, use of crop residue, and good management of irrigation water help to conserve irrigation water, maintain organic matter content, and control erosion. Minimum tillage and use of green manure crops also help to maintain organic matter content.

This soil can be used for irrigated pasture and hay crops. It is suited to tall wheatgrass and clover. Irrigation can be done by contour ditch and corrugation methods.

Because annual precipitation is low and has poor seasonal distribution, this soil is unsuited to nonirrigated crops. However, nonirrigated pasture grasses can be planted late in summer and in fall to protect the soil from

erosion and to provide limited grazing for livestock, if good pasture management is practiced. Siberian wheatgrass, crested wheatgrass, and tall wheatgrass are adapted species.

The potential plant community on this soil consists mainly of saltgrass, alkali sacaton, galleta, western wheatgrass, fourwing saltbush, and greasewood. As range condition deteriorates, alkali sacaton, galleta, western wheatgrass, and fourwing saltbush decrease, forbs and other woody shrubs increase, and undesirable weeds and annual plants invade and become more abundant.

Seeding has limited success but may be advisable if range is in poor condition. Best results can be expected from sand dropseed and western wheatgrass. Irrigation may be required in newly seeded areas until the plants are established. Preparing a seedbed and drilling the seed help to obtain the best results. Grasses that meet the seasonal requirements of livestock should be selected. Seeded areas should be fenced.

Small included areas of poorly drained soils in this map unit have potential for development of wetland wildlife habitat. Open water areas can be developed by blasting or by use of heavy equipment to provide nesting cover for waterfowl and shorebirds. Inland saltgrass, an important source of food for waterfowl, occurs naturally in these poorly drained areas.

This soil is suited to most of the orchard crops grown in the survey area. The principal orchard crops grown on this soil are apples, pears, cherries, and peaches. In places salinity and alkalinity hinder tree growth and production of fruit. In areas where air drainage is poor, fruit crops can be seriously damaged by frost in spring. Cover crops are necessary to control erosion but should be managed so that they do not compete with fruit trees. Application of fertilizer promotes the best growth of trees and the production of fruit. Fertilizer requirements should be based on soil or foliage analysis. An intensive spray program is generally needed to control insects and disease. Estimated average yields per acre for orchard crops are as follows: apples, 650 bushels; peaches, 500 bushels; cherries, 650 bushels; and pears, 500 bushels.

If this soil is used for urban development, the main limitations are shrink-swell potential, corrosivity, and low strength. If it is used for septic tank absorption fields, permeability is the main limitation. The limitations can be overcome by the use of proper design and construction methods.

This soil is in capability subclasses IIIe, irrigated, and VIIe, nonirrigated.

16—Billings silty clay loam, gullied, 0 to 6 percent slopes. This is a deep, well drained soil. It formed in silty alluvium and is on fans and flood plains. This soil has gullies 5 to 10 feet deep and 10 to 25 feet wide that make up about 5 percent of the acreage of the map unit. Elevation ranges from 4,500 to 6,500 feet. Average annual precipitation is about 10 inches, average annual air temperature is about 50 degrees F, and the average frost-free season is about 150 days.

Typically the surface layer is light brownish gray silty clay loam about 4 inches thick. The underlying material, to a depth of 60 inches, is light brownish gray, stratified silty clay loam and clay loam.

Permeability is slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Surface runoff is medium to rapid. The hazard of erosion from wind is moderate and from water is high.

Included with this soil in mapping are a few small areas where stones are on the surface and in the profile. Also included are Chipeta, Persayo, and Killpack soils and some areas of wet alluvial land and Gullied land. In some areas the surface layer is silty clay or silt loam.

The native vegetation on this soil consists mainly of greasewood, shadscale, fourwing saltbush, and galleta grass.

Most areas of this soil are used for grazing of livestock and wildlife and for recreational purposes.

Because annual precipitation is low and has poor seasonal distribution, this soil is not suited to nonirrigated crops. However, nonirrigated pasture grasses can be planted late in summer and in fall to protect the soil from erosion and to provide limited grazing for livestock, if proper pasture management is practiced. Siberian wheatgrass, tall wheatgrass, and crested wheatgrass are adapted species.

The potential plant community on this soil consists mainly of saltgrass, alkali sacaton, galleta, western wheatgrass, fourwing saltbush, and greasewood. As range condition deteriorates, alkali sacaton, galleta, western wheatgrass, and fourwing saltbush decrease, forbs and other woody shrubs increase, and undesirable weeds and annual plants invade and become more abundant.

Seeding has limited success but may be advisable if range is in poor condition. Best results can be expected from sand dropseed and western wheatgrass. Irrigation may be required in newly seeded areas until the plants are established. Preparing a seedbed and drilling the seed help to obtain the best results. Grasses that meet the seasonal requirements of livestock should be selected. Seeded areas should be fenced.

Small included areas of poorly drained soils in this map unit have potential for development of wetland wildlife habitat. Open water areas can be developed by blasting or by use of heavy equipment to provide nesting habitat for waterfowl and shorebirds. Inland saltgrass, an important source of food for waterfowl, occurs naturally in these poorly drained areas.

If this soil is used for urban development, the main limitations are shrink-swell potential, corrosivity, and low strength. If it is used for septic tank absorption fields, permeability is the main limitation. The limitations can be overcome by the use of proper design and construction

methods. This soil is in capability subclass VIIe, nonirrigated.

17—Breece loam, 1 to 6 percent slopes. This is a deep, well drained soil. It formed in alluvial material and is on alluvial fans, flood plains, and terraces. Elevation ranges from 6,000 to 7,500 feet. Average annual precipitation is about 20 inches, average annual air temperature is about 40 degrees F, and the average frost-free season is about 90 days.

Typically the surface layer is dark brown loam about 19 inches thick. The upper part of the underlying material is pale brown sandy loam about 11 inches thick. The lower part, to a depth of 60 inches, is pale brown sandy loam that has a few fine, faint, yellowish brown mottles.

Permeability is rapid, and available water capacity is moderate. Effective rooting depth is about 55 inches. Surface runoff is medium. The hazard of erosion from wind is slight and from water is moderate. The water table is at a depth of 3 to 6 feet.

Included with this soil in mapping are a few small areas of Fughes and Curecanti soils. Also included are some areas of wet alluvial land. In some areas the surface layer is sandy loam or light clay loam. Also included are areas of extremely gravelly and cobbly soils.

The native vegetation on this soil consists mainly of western wheatgrass, brome, sedges, big sagebrush, serviceberry, and cottonwood trees.

Most areas of this soil are used for irrigated crops, mainly hay and pasture.

This soil is suited to all of the crops commonly grown in the survey area. Shortness of the growing season may limit yields and the choice of crops. Care is necessary to prevent wind and water erosion. Maintaining the content of organic matter is important. The soil can be used for continuous row crops, or it can be planted to close-growing crops about one-fourth of the time. Because this soil is coarse textured, frequent application of irrigation water is necessary. Using green manure crops, returning crop residue to the soil, good management of irrigation water, using grasses and legumes in rotation, land leveling, and minimum tillage help to maintain organic matter content and control erosion.

This soil can be used for irrigated pasture and hay crops. It is well suited to alfalfa, smooth brome, orchardgrass, and clover. Irrigation can be done by contour ditch, corrugation, and furrow methods.

Because annual precipitation is low and has poor seasonal distribution, this soil is not suited to nonirrigated crops. However, nonirrigated pasture grasses can be planted late in summer and in fall to protect the soil from erosion and to provide grazing for livestock, if proper pasture management is practiced. Crested wheatgrass, intermediate wheatgrass, and smooth brome are adapted species.

The potential plant community on this soil consists mainly of western wheatgrass and basin wildrye. As range condition deteriorates, western wheatgrass decreases, forbs and woody shrubs increase, and undesirable weeds and annual plants invade and become more abundant.

Seeding is advisable if range is in poor condition. Western wheatgrass, basin wildrye, and slender wheatgrass are suitable for seeding. Grasses that meet the seasonal requirements of livestock should be selected. Preparing a seedbed and drilling the seed help to obtain the best results. On some sites control of competing shrubs is required to improve range condition. Fencing of seeded areas is required, because this soil is more productive and is in a lower position than adjacent soils and generally has the stockwater supply for adjacent soils. Stockwater developments may be required.

This soil is in productive, low-lying areas that receive additional moisture from adjacent soils on uplands. It is used for winter range by mule deer and has potential for development of shrub plantings and food plots.

If this soil is used for urban development, the main limitation is depth to the water table. This limitation can be overcome by the use of proper design and construction methods.

This soil is in capability subclasses IVe, irrigated, and VIe, nonirrigated.

18—Bulkley clay loam, 12 to 25 percent slopes. This is a deep, well drained soil that overlies shale and interbedded sandstone. It formed in fine textured alluvium and is on mountain side slopes and uplands. Elevation ranges from 6,500 to 8,500 feet. Average annual precipitation is about 18 inches, average annual air temperature is about 37 degrees F, and the average frost-free season is about 100 days.

Typically the surface layer is grayish brown clay loam about 3 inches thick. The subsoil is grayish brown or light brownish gray clay about 42 inches thick. The substratum, to a depth of 60 inches, is pale brown silty clay loam.

Permeability is slow, and available water capacity is high. Effective rooting depth is about 60 inches. Surface runoff is rapid. The hazard of erosion from wind is slight and from water is moderate to high.

Included with this soil in mapping are a few small areas of Fughes and Cochetopa soils. Also included are rock outcrops on knobs and crests of hills. In some areas the surface layer is light clay. In some small areas, mostly on hilltops, gravel and cobbles are on the surface. In some areas shale or interbedded sandstone is at a depth of 40 to 70 inches.

The native vegetation on this soil consists mainly of western wheatgrass, fescue, oakbrush, serviceberry, and aspen.

Because annual precipitation is low and has poor seasonal distribution, this soil is not suited to nonirrigated crops. Where native grasses have been depleted or destroyed, however, a high degree of success can be expected from pasture plantings of nonirrigated grasses in spring, late in summer, and in fall to protect the soil from

erosion and to provide grazing for livestock. Smooth brome, crested wheatgrass, and intermediate wheatgrass are suitable for seeding. Good pasture management must be practiced to maintain the grasses.

The potential plant community on this soil consists mainly of wheatgrasses, bluegrasses, and needlegrasses. As range condition deteriorates, wheatgrasses and needlegrasses decrease, forbs and woody shrubs increase, and undesirable weeds and annual plants invade and become more abundant.

Seeding is advisable where slopes do not exceed 20 percent, if range is in poor condition. Bluebunch wheatgrass, western wheatgrass, and big bluegrass are suitable for seeding. Grasses that meet the seasonal requirements of livestock should be selected. Preparing a seedbed and drilling the seed help to obtain the best results. On some sites, control of competing shrubs is required to improve range condition. Seeded or brushed areas should be fenced.

This soil is used for grazing, recreation, and wildlife. It is used for winter range by mule deer and elk. Some important plant species which can be managed for optimum production are bitterbrush, mountainmahogany, Gambel oak, serviceberry, and elk sedge. Berry-producing shrubs are an important habitat element of black bear. This soil provides habitat for Merriam turkey, blue grouse, and band-tailed pigeon. In favorable years, mature Gambel oaks produce acorns, which are used by Merriam turkey.

If this soil is used for urban development, the main limitations are shrink-swell potential and slope. If this soil is used for septic tank absorption fields, permeability is the main limitation. The limitations can be overcome by the use of proper design and construction methods.

This soil is in capability subclass VIe, nonirrigated.

19—Bulkley clay loam, 25 to 65 percent slopes. This is a deep, well drained soil that overlies shale and interbedded sandstone. It formed in fine textured alluvium and is on mountain side slopes and uplands. Elevation ranges from 6,500 to 8,500 feet. Average annual precipitation is about 18 inches, average annual air temperature is about 37 degrees F, and the average frost-free season is about 100 days.

Typically the surface layer is grayish brown clay loam about 3 inches thick. The subsoil is grayish brown or light brownish gray clay about 42 inches thick. The substratum, to a depth of 60 inches, is pale brown silty clay loam.

Permeability is slow, and available water capacity is high. Effective rooting depth is about 60 inches. Surface runoff is rapid and very rapid. The hazard of erosion from wind is slight and from water is moderate to high.

Included with this soil in mapping are a few small areas of Fughes and Cochetopa soils. Also included are rock outcrops on knobs and crests of hills. In some areas the surface layer is light clay. In some small areas, mostly on hilltops, gravel and cobbles are on the surface. In some areas shale or interbedded sandstone is at a depth of 40 to 60 inches. Slips and landslides may occur, especially in disturbed areas.

The native vegetation on this soil consists mainly of western wheatgrass, fescue, oakbrush, serviceberry, and aspen.

Because of steepness of slope, this soil is unsuited to crops and reseeding of depleted or destroyed native vegetation is not feasible by conventional methods. A fair degree of success can be expected from broadcasting seed of nonirrigated grasses in spring or fall. Smooth brome, intermediate wheatgrass, and crested wheatgrass are adapted grasses. Good pasture management should be practiced to maintain the grasses.

The potential plant community on this soil consists mainly of wheatgrasses, bluegrasses, and needlegrasses. As range condition deteriorates, wheatgrasses and needlegrasses decrease, forbs and woody shrubs increase, and undesirable weeds and annual plants invade and become more abundant.

On some sites, control of competing shrubs is required to improve range condition. Seeded or brushed areas should be fenced.

This soil is used for grazing, recreation, and wildlife. It is used for winter range by mule deer and elk. Some important plant species which can be managed for optimum production are bitterbrush, mountainmahogany, Gambel oak, serviceberry, and elk sedge. Berry-producing shrubs are an important habitat element of black bear. This soil provides habitat for Merriam turkey, blue grouse, and band-tailed pigeon. In favorable years, mature Gambel oaks produce acorns, which are used by Merriam turkey.

If this soil is used for urban development, the main limitations are shrink-swell potential and slope. If it is used for septic tank absorption fields, permeability is the main limitation. The limitations can be overcome by the use of proper design and construction methods.

This soil is in capability subclass VIIe, nonirrigated.

20—Cerro loam, 1 to 6 percent slopes. This is a deep, well drained soil. It formed in old landslide deposits and glacial outwash and is on alluvial fans, terraces, and mountain side slopes. Elevation ranges from 6,200 to 8,000 feet. Average annual precipitation is about 12 inches, average annual air temperature is about 44 degrees F, and the average frost-free season is about 125 days.

Typically the surface layer is brown loam about 6 inches thick. The subsoil is reddish brown clay and heavy clay loam about 25 inches thick. The substratum, to a depth of 60 inches, is pink gravelly clay loam.

Permeability is slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Surface runoff is medium. The hazard of erosion from wind is slight and from water is moderate.

Included with this soil in mapping are a few small areas of Radersburg, Agua Fria, and Scholle soils. In

some areas the surface layer is clay loam. Cobbles and stones are common on the surface and throughout the profile. The content of stone generally increases below the subsoil.

The native vegetation on this soil consists mainly of western wheatgrass, big sagebrush, Gambel oak, serviceberry, and scattered pinyon and juniper.

Most areas of this soil are used for irrigated crops, mainly hay, small grains, corn for silage, and orchard crops. Areas that are not irrigated are used for grazing of livestock and wildlife and for recreational purposes.

This soil is suited to all of the crops commonly grown in the survey area, but shortness of the growing season may limit the choice of crops. Care is necessary to prevent water and wind erosion. Maintaining the content of organic matter is important. The soil should be kept in grasses, legumes, or close-growing crops at least one-fourth of the time, and row crops in rotation should be grown no more than 3 years consecutively. Use of crop residue, land leveling, good management of irrigation water, and use of cover crops and green manure crops help to maintain organic matter content and to control erosion.

This soil can be used for irrigated pasture and hay crops. It is well suited to alfalfa, smooth brome, orchardgrass, intermediate wheatgrass, and clover. Irrigation can be done by contour ditch, corrugation, and furrow methods.

Because annual precipitation is low and has poor seasonal distribution, this soil is not suited to nonirrigated crops. However, nonirrigated pasture grasses can be planted late in summer and in fall to protect the soil from erosion and to provide grazing for livestock, if good pasture management is practiced. Crested wheatgrass, Russian wildrye, and pubescent wheatgrass are adapted species.

The potential plant community on this soil consists mainly of wheatgrasses, bluegrasses, and needlegrasses. As range condition deteriorates, wheatgrasses and needlegrasses decrease, forbs and woody shrubs increase, and undesirable weeds and annual plants invade and become more abundant.

Seeding is advisable if range is in poor condition. Bluebunch wheatgrass, western wheatgrass, and big bluegrass are suitable for seeding. Grasses that meet the seasonal requirements of livestock should be selected. Preparing a seedbed and drilling the seed help to obtain the best results. On some sites control of competing shrubs is required to improve range condition. Seeded or brushed areas should be fenced.

This soil is used for winter range by mule deer and elk. Some important plant species which can be managed for optimum production are bitterbrush, mountainmahogany, Gambel oak, serviceberry, and elk sedge. Berry-producing shrubs are an important habitat element of black bear. This soil provides habitat for Merriam turkey, blue grouse, and band-tailed pigeon. In favorable years mature Gambel oaks produce acorns, which are used by Merriam turkey.

If this soil is used for urban development, the main limitation is shrink-swell potential. If it is used for septic tank absorption fields, permeability is the main limitation. The limitations can be overcome by the use of proper design and construction methods.

This soil is in capability subclasses IVe, irrigated, and VIe, nonirrigated.

21—Cerro loam, 6 to 12 percent slopes. This is a deep, well drained soil. It formed in old landslide deposits and glacial outwash and is on alluvial fans, terraces, and mountain side slopes. Elevation ranges from 6,200 to 8,000 feet. Average annual precipitation is about 12 inches, average annual air temperature is about 44 degrees F, and the average frost-free season is about 125 days.

Typically the surface layer is brown loam about 6 inches thick. The subsoil is reddish brown clay and heavy clay loam about 25 inches thick. The substratum, to a depth of 60 inches, is pink gravelly clay loam.

Permeability is slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Surface runoff is medium to rapid. The hazard of erosion from wind is slight and from water is moderate to high.

Included with this soil in mapping are a few small areas of Radersburg, Agua Fria, and Scholle soils. In some areas the surface layer is clay loam. Cobbles and stones are common on the surface and throughout the profile. Content of stones generally increases with increasing depth.

The native vegetation on this soil consists mainly of western wheatgrass, big sagebrush, Gambel oak, serviceberry, and scattered pinyon and juniper.

This soil is used for grazing of livestock and wildlife and for recreational purposes. Some areas of this soil are used for irrigated crops, mainly hay, small grains, pasture, and orchards. Areas that are not irrigated are used for grazing of livestock and wildlife and for recreational purposes.

This soil is suited to all of the crops commonly grown in the survey area, except those which require a long growing season. Care is necessary to prevent water and wind erosion. Maintaining organic matter content is important. The soil should be kept in grasses, legumes, or close-growing crops at least one-fourth of the time, and row crops in rotation should be grown no more than 3 years consecutively. Use of crop residue, land leveling, good management of irrigation water, and using cover crops and green manure crops help to maintain organic matter content and to control erosion.

This soil can be used for irrigated pasture and hay crops. It is well suited to alfalfa, smooth brome, orchardgrass, intermediate wheatgrass, and clover. Irrigation can be done by contour ditch and corrugation methods.

Because annual precipitation is low and has poor seasonal distribution, this soil is not suited to nonirrigated

crops. However, nonirrigated pasture grasses can be planted late in summer and in fall to protect the soil from erosion and to provide grazing for livestock, if good pasture management is practiced. Crested wheatgrass, Russian wildrye, and pubescent wheatgrass are adapted species.

The potential plant community on this soil consists mainly of wheatgrasses, bluegrasses, and needlegrasses. As range condition deteriorates, the wheatgrasses and needlegrasses decrease, forbs and woody shrubs increase, and undesirable weeds and annual plants invade and become more abundant.

Seeding is advisable if range is in poor condition. Bluebunch wheatgrass, western wheatgrass, and big bluegrass are suitable for seeding. Grasses that meet the seasonal requirements of livestock should be selected. Preparing a seedbed and drilling the seed help to obtain the best results. On some sites control of competing shrubs is required to improve range condition. Seeded or brushed areas should be fenced.

This soil is used for winter range by mule deer and elk. Some important plant species which can be managed for optimum production are bitterbrush, mountainmahogany, Gambel oak, serviceberry, and elk sedge. Berry-producing shrubs are an important habitat element of black bear. This soil provides habitat for Merriam turkey, blue grouse, and band-tailed pigeon. In favorable years, mature Gambel oaks produce acorns, which are used by Merriam turkey.

If this soil is used for urban development, the main limitation is shrink-swell potential. If it is used for septic tank absorption fields, permeability is the main limitation. The limitations can be overcome by the use of proper design and construction methods.

This soil is in capability subclasses IVe, irrigated, and VIe, nonirrigated.

22—Cerro stony loam, 10 to 35 percent slopes. This is a deep, well drained soil. It formed in old landslide deposits and glacial outwash and is on alluvial fans, terraces, and mountain side slopes. Elevation ranges from 6,200 to 8,000 feet. Average annual precipitation is about 12 inches, average annual air temperature is about 44 degrees F, and the average frost-free season is about 125 days.

Typically the surface layer is brown stony loam about 6 inches thick. The subsoil is reddish brown clay and heavy clay loam about 25 inches thick. The substratum, to a depth of 60 inches, is pink gravelly clay loam.

Permeability is slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Surface runoff is medium to rapid. The hazard of erosion from wind is slight and from water is high.

Included with this soil in mapping are a few small areas of Radersburg, Scholle, Midway, and Gaynor soils. Also included are some areas of rough broken land. In some areas the surface layer is clay loam or is very stony or extremely stony. The content of stones generally increases with increasing depth.

The native vegetation on this soil consists mainly of western wheatgrass, big sagebrush, Gambel oak, serviceberry, pinyon, and juniper.

Most areas of this soil are used for grazing of livestock and wildlife and for recreational purposes.

Because of surface stoniness and slope, this soil is unsuited to crops. Seedbed preparation and drilling of seed for pasture plantings on depleted native range or in cleared areas generally are not practical because of surface stoniness. A limited degree of success can be expected by broadcasting seed late in summer or early in fall. Pubescent wheatgrass, Russian wildrye, and crested wheatgrass are adapted species. Good pasture management must be practiced to protect the soil from erosion and to provide grazing for livestock.

The potential plant community on this soil consists mainly of wheatgrasses, bluegrasses, and needlegrasses. As range condition deteriorates, the wheatgrasses and needlegrasses decrease, forbs and woody shrubs increase, and undesirable weeds and annual plants invade and become more abundant.

Seeding is advisable if range is in poor condition. Bluebunch wheatgrass, western wheatgrass, and big bluegrass are suitable for seeding. Grasses that meet the seasonal requirements of livestock should be selected. Where possible, preparing a seedbed and drilling the seed help to obtain the best results. On some sites, control of competing shrubs is required to improve range condition. Seeded or brushed areas should be fenced.

This soil is used for winter range by mule deer and elk. Some important plant species which can be managed for optimum production are bitterbrush, mountainmahogany, Gambel oak, serviceberry, and elk sedge. Berry-producing shrubs are an important habitat element of black bear. This soil provides habitat for Merriam turkey, blue grouse, and band-tailed pigeon. In favorable years, mature Gambel oaks produce acorns, which are used by Merriam turkey.

If this soil is used for urban development, the main limitations are shrink-swell potential, stoniness, and slope. If this soil is used for septic tank absorption fields, permeability is also a limitation. The limitations can be overcome by the use of proper design and construction methods.

This soil is in capability subclass VIIs, nonirrigated.

23—Chipeta silty clay, 3 to 30 percent slopes. This is a shallow, well drained soil that overlies Mancos Shale at a depth of 10 to 20 inches. It formed in this shale and is on uplands. Elevation ranges from 4,800 to 6,000 feet. Average annual precipitation is about 9 inches, average annual air temperature is about 50 degrees F, and the average frost-free season is about 145 days.

Typically the surface layer is light brownish gray silty clay about 4 inches thick. The underlying material is light

brownish gray, moderately alkaline silty clay. Mancos Shale is at a depth of about 15 inches.

Permeability is slow, and available water capacity is low. Effective rooting depth is about 15 inches. Surface runoff is medium to rapid. The hazard of erosion from wind is slight and from water is high.

Included with this soil in mapping are a few small areas of Killpack, Billings, and Persayo soils. Also included are some areas of shale rockland. These areas are below mesas and benches and commonly have a gravelly or cobbly surface layer. In some areas the surface layer is silt loam or silty clay loam.

Because of slope, shallow soil depth, and low available water capacity, this soil is unsuited to crops. Only fair results can be expected from grass plantings in areas where the slope permits seedbed preparation and drilling of seed. If established, tall wheatgrass, Siberian wheatgrass, and crested wheatgrass can be planted to protect the soil from erosion and to provide very limited grazing for livestock.

The potential plant community on this soil consists mainly of galleta, Indian ricegrass, and mat saltbush. As range condition deteriorates, Indian ricegrass and galleta decrease, and woody shrubs increase, and undesirable weeds and annual plants invade and become more abundant.

Seeding has only limited success but may be advisable where slope is less than 20 percent, if range is in poor condition. Best results can be expected from Indian ricegrass and alkali sacaton. Irrigation may be required in newly seeded areas until the plants are established. Preparing a seedbed and drilling the seed help to obtain the best results. Grasses that meet the seasonal requirements of livestock should be selected. Seeded areas should be fenced.

This soil provides habitat for pronghorn antelope, desert cottontail, and mourning dove. Where water is available, water developments and food plots can be used to improve wildlife habitat. If this soil is used for irrigated crops, a conservation cropping system that includes grain crops improves habitat for ring-necked pheasant. A food supply and nesting cover are important habitat elements of pheasant.

If this soil is used for urban development, the main limitations are depth to bedrock, shrink-swell potential, slope, and corrosivity. If it is used for septic tank absorption fields, permeability is also a limitation. The limitations can be overcome by the use of proper design and construction methods.

This soil is in capability subclass VIIe, nonirrigated.

24—Cliffdown gravelly loam, 0 to 12 percent slopes. This is a deep, well drained soil. It formed in gravelly and cobbly alluvium and is on terraces and outwash fans. Elevation ranges from 4,800 to 6,500 feet. Average annual precipitation is about 9 inches, average annual air temperature is about 51 degrees F, and the average frost-free season is about 145 days.

Typically the surface layer is pale brown gravelly loam about 9 inches thick. The upper part of the underlying material is white, extremely gravelly sandy loam about 11 inches thick. The lower part, to a depth of 60 inches, is white, strongly calcareous, extremely gravelly heavy loamy sand.

Permeability is moderately rapid, and available water capacity is low. Effecitve rooting depth is 60 inches or more. Surface runoff is medium. The hazard of erosion from wind is slight and from water is moderate.

Included with this soil in mapping are a few small areas of Mesa, Agua Fria, and Scholle soils. In some areas the surface layer is sandy loam or clay loam.

Because annual precipitation is low and has poor seasonal distribution, this soil is not suited to nonirrigated crops. However, nonirrigated pasture grasses can be planted late in summer and in fall to protect the soil from erosion and to provide limited grazing for livestock, if good pasture management is practiced. Siberian wheatgrass, western wheatgrass, crested wheatgrass, and Russian wildrye are adapted species.

The potential plant community on this soil consists mainly of galleta, Indian ricegrass, Gardner saltbush, and shadscale. As range condition deteriorates, galleta and Indian ricegrass decrease, forbs and woody shrubs increase, and undesirable weeds and annual plants invade and become more abundant.

Seeding is advisable if range is in poor condition. Best results can be expected from sand dropseed, Indian ricegrass, and thickspike wheatgrass. Irrigation may be required in newly seeded areas until the plants are established. Preparing a seedbed and drilling the seed help to obtain the best results. Grasses that meet the seasonal requirements of livestock should be selected. Seeded areas should be fenced.

This soil is used for grazing, recreation, and wildlife. It provides habitat for pronghorn antelope, desert cottontail, and mourning dove. Where water is available, water developments and food plots can be used to improve wildlife habitat. If this soil is used for irrigated crops, a conservation cropping system that includes grain crops improves habitat for ring-necked pheasant. A food supply and nesting cover are important habitat elements required by pheasant.

If this soil is used for urban development, the main limitation is high content of cobbles and stones. This limitation can be overcome by the use of proper design and construction methods.

This soil is in capability subclass VIIe, nonirrigated.

25—Cochetopa stony loam, 10 to 40 percent slopes. This is a deep, well drained soil. It formed in landslide deposits and alluvium and is on uplands, fans, and side slopes of valleys and mountains. Elevation ranges from 8,000 to 9,800 feet. Average annual precipitation is about 22 inches, average annual air temperature is about 39 degrees F, and the average frost-free season is about 75 days.

Typically the surface layer is dark gray stony loam about 18 inches thick. The subsoil is yellowish brown or brown stony clay loam about 18 inches thick. The substratum, to a depth of 60 inches, is light gray stony heavy clay loam.

Permeability is slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Surface runoff is medium to rapid. The hazard of erosion from wind is slight and from water is moderate to high.

Included with this soil in mapping are a few small areas of Delson, Fughes, and Curecanti soils. Also included are areas of steep, stony soils and Fluvaquents, flooded. In some areas the surface layer is stony clay loam or is free of stones. In some small areas the soil has a higher content of stones and cobbles.

The native vegetation on this soil consists mainly of aspen, scattered spruce, and adapted grasses.

Most areas of this soil are in noncommercial forest and are used for limited grazing of livestock and wildlife and for recreational purposes.

Because of surface stoniness and slope, this soil is unsuited to crops. Seedbed preparation and drilling of seed for pasture plantings on depleted native range or in cleared areas generally are not practical because of surface stoniness. A limited degree of success can be expected by broadcasting seed late in summer or early in fall. Intermediate wheatgrass, smooth brome, and crested wheatgrass are adapted species. Good pasture management must be practiced to protect the soil from erosion and to provide grazing for livestock.

The potential plant community consists mainly of fescues, needlegrasses, and wheatgrasses. As range condition deteriorates, these grasses decrease, forbs and woody shrubs increase, and undesirable weeds and annual plants invade and become more abundant.

Seeding is advisable where slope and stoniness are not excessive, if range is in poor condition. Western wheatgrass, slender wheatgrass, and Arizona fescue are suitable for seeding. Grasses that meet the seasonal requirements of livestock should be selected. Where possible, preparing a seedbed and drilling the seed help to obtain the best results.

This soil provides habitat for band-tailed pigeon, blue grouse, mule deer, elk, and black bear. Proper grazing use by livestock on these soils helps to maintain good habitat for the larger wildlife. Grasses and forbs on this soil provide summer range for mule deer and elk.

If this soil is used for urban development, the main limitations are the presence of large stones, shrink-swell potential, low strength, and slope. If it is used for septic tank absorption fields, permeability is also a limitation. The limitations can be overcome by the use of proper design and construction methods.

This soil is in capability subclass VIIs, nonirrigated.

26—Colona silty clay loam, 1 to 6 percent slopes. This is a deep, well drained soil. It formed in alluvium and is on fans, terraces, and valley foot slopes. Elevation ranges from 5,800 to 7,000 feet. Average annual precipitation is about 12 inches, average annual air temperature is about 47 degrees F, and the average frost-free season is about 130 days.

Typically the surface layer is light brownish gray silty clay loam about 3 inches thick. The subsoil is grayish brown silty clay about 20 inches thick. The substratum, to a depth of 60 inches, is light gray silty clay.

Permeability is slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Surface runoff is medium. The hazard of erosion from wind and water is moderate.

Included with this soil in mapping are a few small areas of Razor, Gaynor, Apishapa, and Billings soils and some areas of Fluvaquents, flooded, and Gullied land. In some areas the surface layer is silt loam or silty clay.

The native vegetation on this soil consists mainly of big sagebrush, fourwing saltbush, greasewood, western wheatgrass, Indian ricegrass, and squirreltail.

Some areas of this soil are used for grazing of livestock and wildlife and for recreational purposes. Some areas are used for irrigated crops, mainly hay, pasture, small grains, and corn for silage. Some irrigated areas are used for orchard crops.

This soil is suited to all of the crops commonly grown in the survey area, except those which require a long growing season. Extreme care is necessary to prevent water erosion. Maintaining the content of organic matter is important. The soil should be kept in grasses, legumes, or close-growing crops at least one-fourth of the time; and row crops in rotation should be grown no more than 3 years consecutively. The use of crop residue, land leveling, good management of irrigation water, and using cover crops and green manure crops help to maintain organic matter content and to control erosion. Shortness of the growing season may limit yields and the choice of crops.

This soil can be used for irrigated pasture and hay crops. It is well suited to alfalfa, smooth brome, orchardgrass, intermediate wheatgrass, and clover. Irrigation can be done by contour ditch, corrugation, and furrow methods.

Because annual precipitaiton is low and has poor seasonal distribution, this soil is not suited to nonirrigated crops. However, nonirrigated pasture grasses can be planted late in summer and in fall to protect the soil from erosion and to provide grazing for livestock, if proper pasture management is practiced. Crested wheatgrass, pubescent wheatgrass, and Russian wildrye are adapted species.

The potential plant community on this soil consists mainly of galleta, western wheatgrass, and beardless wheatgrass. As range condition deteriorates, galleta and wheatgrasses decrease, forbs and woody shrubs increase, and undesirable weeds and annual plants invade and become more abundant.

Seeding is advisable if range is in poor condition. Western wheatgrass and Indian ricegrass are suitable for seeding. Grasses that meet the seasonal requirements of livestock should be selected. Preparing a seedbed and drilling the seed help to obtain the best results. Seeded areas should be fenced.

This soil is used for winter range by mule deer. Big sagebrush commonly is grazed by mule deer in winter and can be managed for optimum production. Desert cottontail are common in areas of this soil, but their numbers depend largely upon climatic conditions.

This soil is suited to most of the orchard crops grown in the survey area. The principal orchard crops grown on this soil are apples, cherries, peaches, and pears. Because of the position of this soil on the landscape, air drainage is poor and frost early in spring can severely damage fruit crops. Cover crops are necessary to control erosion but should be managed so that they do not compete with fruit trees. Application of fertilizer promotes the best growth of trees and the production of high quality fruit. Fertilizer requirements should be based on soil or foliage analysis. An intensive spray program is generally needed to control insects and disease. Estimated average yields per acre for orchard crops are as follows: apples, 700 bushels; peaches, 550 bushels; cherries, 700 bushels; and pears, 550 bushels.

If this soil is used for urban development, the main limitations are shrink-swell potential and low strength. If it is used for septic tank absorption fields, permeability is the main limitation. The limitations can be overcome by the use of proper design and construction methods.

This soil is in capability subclasses IVe, irrigated, and VIe, nonirrigated.

27—Colona silty clay loam, 6 to 12 percent slopes. This is a deep, well drained soil. It formed in alluvium and is on fans and terraces and in swales. Elevation ranges from 5,800 to 7,000 feet. Average annual precipitation is about 12 inches, average annual air temperature is about 47 degrees F, and the average frost-free season is about 130 days.

Typically the surface layer is light brownish gray silty clay loam about 3 inches thick. The subsoil is grayish brown silty clay about 20 inches thick. The substratum, to a depth of 60 inches, is light gray silty clay.

Permeability is slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Surface runoff is rapid. The hazard of erosion from wind is moderate and from water is high.

Included with this soil in mapping are a few small areas of Billings, Midway, Razor, Gaynor, and Apishapa soils. Also included are some areas of Fluvaquents, flooded. In some areas the surface layer is silt loam or silty clay. Stones on the surface and in underlying layers are common in areas at the base of mesas. In some areas the surface layer is darker colored.

The native vegetation on this soil consists mainly of big sagebrush, fourwing saltbush, greasewood, and grasses.

Some areas of this soil are used for grazing of livestock and wildlife and for recreational purposes. Some areas are used for irrigated crops, mainly hay, pasture, small grains, and orchard crops.

This soil is suited to all of the crops commonly grown in the survey area, except those which require a long growing season. Extreme care is necessary to prevent water erosion. Maintaining organic matter content is important. The soil should be kept in grasses, legumes, or close-growing crops at least one-fourth of the time, and row crops in rotation should be grown no more than 3 years consecutively. Use of crop residue, land leveling, and good management of irrigation water help to maintain organic matter content and to control erosion.

This soil can be used for irrigated pasture and hay crops. It is well suited to alfalfa, smooth brome, orchardgrass, intermediate wheatgrass, and clover. Irrigation can be done by contour ditch and corrugation methods.

Because annual precipitation is low and has poor seasonal distribution, this soil is not suited to nonirrigated crops. However, nonirrigated pasture grasses can be planted late in summer or in fall to protect the soil from erosion and to provide grazing for livestock, if good pasture management is practiced. Crested wheatgrass, pubescent wheatgrass, and Russian wildrye are adapted species.

The potential plant community on this soil consists mainly of galleta, western wheatgrass, and beardless wheatgrass. As range condition deteriorates, galleta and wheatgrasses decrease, forbs and woody shrubs increase, and undesirable weeds and annual plants invade and become more abundant.

Seeding is advisable if range is in poor condition. Western wheatgrass and Indian ricegrass are suitable for seeding. Grassses that meet the seasonal requirements of livestock should be selected. Preparing a seedbed and drilling the seed help to obtain the best results. Seeded areas should be fenced.

This soil is used for winter range by mule deer. Big sagebrush commonly is grazed by mule deer in winter and can be managed for optimum production. Desert cottontail are common in areas of this soil, but their numbers largely depend upon climatic conditions.

This soil is suited to most of the orchard crops grown in the survey area. The principal orchard crops grown on this soil are apples, cherries, peaches, and pears. Because of the position of this soil on the landscape, air drainage is poor and frost can severely damage fruit crops early in spring. Cover crops are necessary to control erosion but should be managed so that they do not compete with fruit trees. Application of fertilizer promotes the best growth of trees and the production of high quality fruit. Fertilizer requirements should be based on soil or foliage analysis. An intensive spray program is

generally needed to control insects and disease. Estimated average yields per acre for orchard crops are as follows: apples, 650 bushels; peaches, 500 bushels; cherries, 650 bushels; and pears, 500 bushels.

If this soil is used for urban development, the main limitations are shrink-swell potential and low strength. If it is used for septic tank absorption fields, permeability is the main limitation. The limitations can be overcome by the use of proper design and construction methods.

This soil is in capability subclasses IVe, irrigated, and VIe, nonirrigated.

28—Colona silty clay loam, 12 to 40 percent slopes. This is a deep, well drained soil. It formed in alluvium and is on fans and terraces and in swales. Elevation ranges from 5,800 to 7,000 feet. Average annual precipitation is about 12 to 16 inches, average annual air temperature is about 47 degrees F, and the average frost-free season is about 130 days.

Typically the surface layer is light brownish gray silty clay loam about 3 inches thick. The subsoil is grayish brown silty clay about 20 inches thick. The substratum, to a depth of 60 inches, is light gray silty clay.

Permeability is slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Surface runoff is rapid. The hazard of erosion from wind is moderate and from water is high.

Included with this soil in mapping are a few small areas of Midway, Razor, Gaynor, Apishapa, and Billings soils. Also included are areas of wet alluvial land, shale rockland, and Badland. In some areas the surface layer is clay loam, silty clay, or silt loam.

The native vegetation on this soil consists mainly of big sagebrush, fourwing saltbush, scattered pinyon and juniper, and grasses.

Most areas of this soil are used for grazing of livestock and wildlife and for recreational purposes.

Because annual precipitation is low and has poor seasonal distribution, this soil is not suited to nonirrigated crops. However, nonirrigated pasture grasses can be planted late in summer and in fall to protect the soil from erosion and to provide limited grazing for livestock, if good pasture management is practiced. Pubescent wheatgrass, Russian wildrye, and crested wheatgrass are adapted species.

The potential plant community on this soil consists mainly of galleta, western wheatgrass, and beardless wheatgrass. As range condition deteriorates, galleta and wheatgrasses decrease, forbs and woody shrubs increase, and undesirable weeds and annual plants invade and become more abundant.

Seeding is advisable where slope does not exceed 20 percent, if range is in poor condition. Western wheatgrass and Indian ricegrass are suitable for seeding. Grasses that meet the seasonal requirements of livestock should be selected. Preparing a seedbed and drilling the seed help to obtain the best results. Seeded areas should be fenced.

This soil is used for winter range by mule deer. Big sagebrush commonly are grazed by mule deer in winter and can be managed for optimum production. Desert cottontail are common in areas of this soil, but their numbers largely depend upon climatic conditions.

If this soil is used for urban development, the main limitations are slope, shrink-swell potential, and low strength. If it is used for septic tank absorption fields, permeability is also a limitation. The limitations can be overcome by the use of proper design and constructiom methods.

This soil is in capability subclass VIIe, nonirrigated.

29—Cryoborolls, very stony. The steep soils in this broadly defined unit are on uplands in the Muddy Creek and Anthracite Creek drainageways. The soils vary in texture but generally are stony. The mapped areas commonly are dissected by intermittent drainageways. Areas of deep soils are interspersed with areas where the soil material is shallow to bedrock. Outcrops of sandstone or shale bedrock are common. Slopes are more than 40 percent.

Included with these soils in mapping are small areas of Fughes, Curecanti, and Cochetopa soils. Small slips or landslides are common on steeper slopes.

Surface runoff is rapid, and the hazard of erosion is high.

The native vegetation consists mainly of conifer timber, aspen, Gambel oak, serviceberry, and adapted grasses. Colorado blue spruce, Douglas-fir, and ponderosa pine are the most common conifers. These soils are used for wildlife habitat, recreational purposes, timber, and limited grazing.

If these soils are used for urban development, the main limitations are slope and stoniness. These limitations are difficult or impractical to overcome.

These soils are in capability subclass VIIe, nonirrigated.

30—Curecanti loam, 3 to 15 percent slopes. This is a deep, well drained soil. It formed in glacial outwash and old landslide deposits and is on uplands and foothills. Elevation ranges from 6,500 to 8,500 feet. Average annual precipitation is about 18 inches, average annual air temperature is about 43 degrees F, and the average frost-free season is about 100 days.

Typically the surface layer is dark grayish brown loam about 13 inches thick. The subsoil is dark brown very gravelly or very cobbly clay loam about 29 inches thick. The substratum, to a depth of 60 inches, is yellowish brown very stony loam.

Permeability is moderate, and available water capacity is moderate. Effective rooting depth is 60 inches or more. Surface runoff is medium. The hazard of erosion from wind is slight and from water is moderate.

Included with this soil in mapping are a few small areas of Fughes, Cochetopa, and Bulkley soils. Also included are some areas of Fluvaquents, flooded. In

some areas the surface layer is sandy loam or stones are on the surface.

The native vegetation on this soil consists mainly of Gambel oak, serviceberry, grasses, and scattered stands of aspen.

Most areas of this soil are used for irrigated crops, mainly hay and pasture.

This soil is suited to all of the crops commonly grown in the survey area, except those which require a long growing season. Care is necessary to prevent water and wind erosion. Maintaining organic matter content is important. The soil should be kept in grasses, legumes, or close-growing crops at least one-fourth of the time, and row crops in rotation should be grown no more than 3 years consecutively. Use of crop residue, land leveling, good management of irrigation water, and using cover crops and green manure crops help to maintain organic matter content and to control erosion. Shortness of the growing season may limit the choice of crops.

This soil can be used for irrigated pasture and hay crops. It is well suited to alfalfa, smooth brome, orchardgrass, intermediate wheatgrass, and clover. Irrigation can be done by contour ditch, corrugation, and furrow methods.

Because annual precipitation is low and has poor seasonal distribution, this soil is not suited to nonirrigated crops. However, nonirrigated pasture grasses can be planted late in summer and in fall to protect the soil from erosion and to provide grazing for livestock, if good pasture management is practiced. Crested wheatgrass, pubescent wheatgrass, and smooth brome are adapted species.

The potential plant community on this soil consists mainly of Gambel oak, mountain brome, nodding brome, slender wheatgrass, and elk sedge. As range condition deteriorates, mountain brome, nodding brome, slender wheatgrass, and elk sedge decrease, forbs and woody shrubs increase, and undesirable weeds and annual plants invade and become more abundant.

Seeding is advisable if range is in poor condition. Slender wheatgrass and western wheatgrass are suitable for seeding. Grasses that meet the seasonal requirements of livestock should be selected. Preparing a seedbed and drilling the seed help to obtain the best results. On some sites, control of competing shrubs is required to improve range condition. Seeded or brushed areas should be fenced.

This soil is used for winter range by mule deer and elk. Some important plant species which can be managed for optimum production are bitterbrush, mountainmahogany, Gambel oak, serviceberry, and elk sedge. Berry-producing shrubs are an important habitat element of black bear. This soil provides habitat for Merriam turkey, blue grouse, and band-tailed pigeon. In favorable years mature Gambel oaks produce acorns which are used by Merriam turkey.

If this soil is used for urban development, the main limitation is stoniness. This limitation can be overcome by the use of proper design and construction methods.

This soil is in capability subclasses IVe, irrigated, and VIe, nonirrigated.

31—Curecanti stony loam, 3 to 30 percent slopes. This is a deep, well drained soil. It formed in glacial outwash and old landslide deposits and is on uplands and foothills. Elevation ranges from 6,500 to 8,500 feet. Average annual precipitation is about 18 inches, average annual air temperature is about 43 degrees F, and the average frost-free season is about 100 days.

Typically the surface layer is dark grayish brown stony loam about 13 inches thick. The subsoil is dark brown very gravelly or very cobbly clay loam about 19 inches thick. The substratum, to a depth of 60 inches, is yellowish brown very stony loam.

Permeability is moderate, and available water capacity is moderate. Effective rooting depth is 60 inches or more. Surface runoff is medium to rapid. The hazard of erosion from wind is slight and from water is moderate to high.

Included with this soil in mapping are a few small areas of Fughes and Cochetopa soils. Also included are some areas of Cryoborolls, very stony, and Fluvaquents, flooded. In some areas the soil is free of stones.

The native vegetation on this soil consists mainly of Gambel oak, serviceberry, grasses, and scattered stands of aspen.

Most areas of this soil are used for grazing of livestock and wildlife and for recreational purposes.

Because of surface stoniness and slope, this soil is unsuited to crops. Seedbed preparation and drilling of seed for pasture plantings on depleted native range or in cleared areas are generally not practical because of surface stoniness. A limited degree of success can be expected by broadcasting seed late in summer or early in fall. Pubescent wheatgrass, smooth brome, and crested wheatgrass are adapted species. Good pasture management is needed to protect the soil from erosion and to provide grazing for livestock.

The potential plant community on this soil consists mainly of Gambel oak, mountain brome, nodding brome, slender wheatgrass, and elk sedge. As range condition deteriorates, mountain brome, nodding brome, slender wheatgrass, and elk sedge decrease, forbs and woody shrubs increase, and undesirable weeds and annual plants invade and become more abundant.

Seeding is advisable where slope does not exceed 20 percent and the soil is not too stony, if range is in poor condition. Slender wheatgrass and western wheatgrass are suitable for seeding. Grasses that meet the seasonal requirements of livestock should be selected. Where possible, preparing a seedbed and drilling the seed help to obtain the best results. On some sites control of competing shrubs is required to improve range condition. Brush control should be done only where slope does not

exceed 20 percent. Seeded or brushed areas should be fenced.

This soil is used for winter range by mule deer and elk. Some important plant species which can be managed for optimum production are bitterbrush, mountainmahogany, Gambel oak, serviceberry, and elk sedge. Berry-producing shrubs are an important habitat element of black bear. This soil provides habitat for Merriam turkey, blue grouse, and band-tailed pigeon. In favorable years mature Gambel oaks produce acorns which are used by Merriam turkey.

If this soil is used for urban development, the main limitations are stoniness and slope. These limitations can be overcome by the use of proper design and construction methods.

This soil is in capability subclass VIIs, nonirrigated.

32—Delson loam, 3 to 12 percent slopes. This is a deep, well drained soil. It formed in stony alluvium and is on fans and mesas. Elevation ranges from 6,800 to 8,400 feet. Average annual precipitation is about 17 inches, average annual air temperature is about 44 degrees F, and the average frost-free season is about 100 days.

Typically the surface layer is dark brown loam about 8 inches thick. The subsoil is reddish brown light clay about 34 inches thick. The substratum, to a depth of 60 inches, is pale brown stony clay loam.

Permeability is slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Surface runoff is medium. The hazard of erosion from wind is slight and from water is moderate.

Included with this soil in mapping are a few small areas of Agua Fria, Cochetopa, Cerro, and Saraton soils. In some areas the surface layer is cobbly or stony or is light clay loam.

The native vegetation on this soil consists mainly of Gambel oak, serviceberry, big sagebrush, and adapted grasses.

Most areas of this soil are used for irrigated crops, mainly alfalfa, small grains, and pasture. Some areas are used for cool-season truck crops.

This soil is suited to all of the crops commonly grown in the survey area, except those which require a long growing season. Care is necessary to prevent water and wind erosion. Maintaining organic matter content is important. The soil should be kept in grasses, legumes, or close-growing crops at least one-fourth of the time, and row crops in rotation should be grown no more than 3 years consecutively. Use of crop residue, land leveling, good management of irrigation water, and using cover crops and green manure crops help to maintain organic matter content and to control erosion. Shortness of the growing season may limit the choice of crops.

This soil can be used for irrigated pasture and hay crops. It is well suited to alfalfa, smooth brome, orchardgrass, intermediate wheatgrass, and clover. Irrigation can be done by contour ditch, corrugation, and furrow methods.

Because annual precipitation is low and has poor seasonal distribution, this soil is not suited to nonirrigated crops. However, nonirrigated pasture grasses can be planted late in summer and in fall to protect the soil from erosion and to provide grazing for livestock, if good pasture management is practiced. Crested wheatgrass, smooth brome, and pubescent wheatgrass are adapted species.

The potential plant community on this soil consists mainly of wheatgrasses, bluegrasses, and needlegrasses. As range condition deteriorates, wheatgrasses and needlegrasses decrease, forbs and woody shrubs increase, and undesirable weeds and annual plants invade and become more abundant.

Seeding is advisable if range is in poor condition. Bluebunch wheatgrass, western wheatgrass, and big bluegrass are suitable for seeding. Grasses that meet the seasonal requirements of livestock should be selected. Preparing a seedbed and drilling the seed help to obtain the best results. On some sites, control of competing shrubs is required to improve range condition. Seeded or brushed areas should be fenced.

This soil is used for winter range by mule deer and elk. Some important plant species which can be managed for optimum production are bitterbrush, mountainmahogany, Gambel oak, serviceberry, and elk sedge. Berry-producing shrubs are an important habitat element for black bear. This soil provides habitat for Merriam turkey, blue grouse, and band-tailed pigeon. In favorable years mature Gambel oaks produce acorns which are used by Merriam turkey.

If this soil is used for urban development, the main limitation is shrink-swell potential. If it is used for septic tank absorption fields, permeability is the main limitation. The limitations can be overcome by the use of proper design and construction methods.

This soil is in capability subclasses, IVe, irrigated, and VIe, nonirrigated.

33—Delson stony loam, 3 to 20 percent slopes. This is a deep, well drained soil. It formed in stony alluvium and is on fans and mesas. Elevation ranges from 6,800 to 8,400 feet. Average annual precipitation is about 17 inches, average annual air temperature is about 44 degrees F, and the average frost-free season is about 100 days.

Typically the surface layer is dark brown stony loam about 8 inches thick. The subsoil is reddish brown clay about 34 inches thick. The substratum, to a depth of 60 inches, is pale brown stony clay loam.

Permeability is slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Surface runoff is medium to rapid. The hazard of erosion from wind is slight and from water is moderate.

Included with this soil in mapping are a few small areas of Cerro, Agua Fria, and Cochetopa soils. In some

areas the soil is relatively free of stones or has a surface layer of clay loam.

The native vegetation on this soil consists mainly of Gambel oak, serviceberry, big sagebrush, and adapted grasses.

Most areas of this soil are in range and are used for limited grazing of livestock and wildlife and for recreational purposes.

Because of surface stoniness and slope, this soil is unsuited to crops. Seedbed preparation and drilling of seed for pasture plantings on depleted native range or in cleared areas are generally not practical because of surface stoniness. A limited degree of success can be expected by broadcasting seed late in summer or early in fall. Pubescent wheatgrass, crested ricegrass, and smooth brome are adapted species. Good pasture management must be practiced to protect the soil from erosion and to provide grazing for livestock.

The potential plant community on this soil consists mainly of wheatgrasses, bluegrasses, and needlegrasses. As range condition deteriorates, wheatgrasses and needlegrasses decrease, forbs and woody shrubs increase, and undesirable weeds and annual plants invade and become more abundant.

Seeding is advisable where the soil is not too stony, if range is in poor condition. Bluebunch wheatgrass, western wheatgrass, and big bluegrass are suitable for seeding. Grasses that meet the seasonal requirements of livestock should be selected. Where possible, preparing a seedbed and drilling the seed help to obtain the best results. On some sites, control of competing shrubs is required to improve range condition. Seeded or brushed areas should be fenced.

This soil is used for winter range by mule deer and elk. Some important plant species which can be managed for optimum production are bitterbrush, mountainmahogany, Gambel oak, serviceberry, and elk sedge. Berry-producing shrubs are an important habitat element of black bear. This soil provides habitat for Merriam turkey, blue grouse, and band-tailed pigeon. In favorable years mature Gambel oaks produce acorns which are used by Merriam turkey.

If this soil is used for urban development, the main limitations are stoniness, slope, and shrink-swell potential. If it is used for septic tank absorption fields, permeability is the main limitation. The limitations can be overcome by the use of proper design and construction methods.

This soil is in capability subclass VIIs, nonirrigated.

34—Delson very stony loam, 20 to 60 percent slopes. This is a deep, well drained soil. It formed in stony alluvium and colluvium and is on mountain side slopes. Elevation ranges from 6,800 to 8,400 feet. Average annual precipitation is about 17 inches, average annual air temperature is about 44 degrees F, and the average frost-free season is about 100 days.

Typically the surface layer is dark brown very stony loam about 8 inches thick. The subsoil is reddish brown stony clay about 34 inches thick. The substratum, to a depth of 60 inches, is pale brown very stony clay loam.

Permeability is slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Surface runoff is rapid. The hazard of erosion from wind is slight and from water is moderate.

Included with this soil in mapping are a few small areas of Cerro, Agua Fria, and Cochetopa soils. In some areas the soil is relatively free of stones or has a surface layer of clay loam. Small slips are common on steeper slopes.

The native vegetation on this soil consists mainly of Gambel oak, serviceberry, big sagebrush, and adapted grasses.

Most areas of this soil are in range and are used for limited grazing of livestock and wildlife and for recreational purposes.

Because of surface stoniness and slope, this soil is unsuited to crops. Seedbed preparation and drilling of seed for pasture plantings on depleted native range or in cleared areas are generally not practical because of the surface stoniness. A limited degree of success can be expected by broadcasting seed late in summer or early in fall. Pubescent wheatgrass, smooth brome, and crested wheatgrass are adapted species. Good pasture management must be practiced to protect the soil from erosion and to provide grazing for livestock.

The potential plant community on this soil consists mainly of wheatgrasses, bluegrasses, and needlegrasses. As range condition deteriorates, wheatgrasses and needlegrasses decrease, forbs and woody shrubs increase, and undesirable weeds and annual plants invade and become more abundant.

Seeding is advisable where surface stoniness and slope are not excessive, if range is in poor condition. Bluebunch wheatgrass, western wheatgrass, and big bluegrass are suitable for seeding. Grasses that meet the seasonal requirements of livestock should be selected. Where possible, preparing a seedbed and drilling the seed help to obtain the best results. On some sites, control of competing shrubs is required to improve range condition. Seeded or brushed areas should be fenced.

This soil is used for winter range by mule deer and elk. Some important plant species which can be managed for optimum production are bitterbrush, mountainmahogany, Gambel oak, serviceberry, and elk sedge. Berry-producing shrubs are an important habitat element of black bear. This soil provides habitat for Merriam turkey, blue grouse, and band-tailed pigeon. In favorable years mature Gambel oaks produce acorns which are used by Merriam turkey.

If this soil is used for urban development, the main limitations are stoniness, slope, and shrink-swell potential. If it is used for septic tank absorption fields, permeability is the main limitation. The limitations can be over-

come by the use of proper design and construction methods.

This soil is in capability subclass VIIs, nonirrigated.

35—Fluvaquents, flooded. The somewhat poorly drained and poorly drained soils in this broadly defined unit are in low, concave areas and on nearly level to moderately sloping flood plains of narrow, winding valleys. Slopes range from 0 to 10 percent. These soils vary widely in texture, degree of mottling, and depth to the water table.

The surface layer ranges from fine sandy loam to clay loam. The underlying layers generally are loam or heavy clay loam and are stratified with sand, gravel, and cobbles. In some areas gravel and cobbles are near the surface.

The depth to the water table ranges from 2 to 4 feet and is near the surface during part of the year. These soils are subject to rare or occasional flooding.

The native vegetation consists mainly of willow and cottonwood and water-tolerant grasses, sedges, and rushes.

In some areas these soils are artificially drained and are used for crops. If drained, these soils are suited to hay, small grains, pasture, orchard crops, and some row crops. In some areas these soils are used for grazing of livestock and wildlife and for recreational purposes.

Because annual precipitation is low and has poor seasonal distribution, these soils are unsuited to nonirrigated crops. However, nonirrigated pasture grasses can be planted late in summer and in fall to protect the soil from erosion and to provide grazing for livestock, if good pasture management is practiced.

Areas of this map unit provide habitat for many kinds of wildlife. They provide cover for ring-necked pheasant that feed in adjacent farmland. Mourning dove nest in the cottonwoods and tamarisk that grow in these areas. Restricting grazing of livestock helps to maintain the quality of wildlife habitat in areas of these soils. Where these soils are suitable for crops, establishment of food plots, tree and shrub plantings, and nesting cover help to improve habitat for upland wildlife. Where the water table is high, open water areas can be developed to create habitat for waterfowl and shorebirds.

If these soils are used for urban development, the main limitations are the high water table and hazard of flooding. These limitations can be overcome by the use of proper design and construction methods.

These soils are in capability subclass VIw, nonirrigated.

36—Fluvents, flooded. The soils in this broadly defined unit are in narrow, winding valleys, on small fans, and on toe slopes of mountains. Slopes range from 0 to 6 percent. These soils are scattered throughout the survey area. They are mainly well drained and consist of an accumulation of valley-filling sediment derived from a variety of rocks and upland soils. Some of the sediment has been carried only a short distance by fast-moving water, and sorting of soil particles and rock fragments is slight. Some of the sediment has been carried a considerable distance, and sorting and stratification are more pronounced.

The surface layer generally is loamy but ranges from moderately coarse textured to moderately fine textured. The underlying layers are stratified and are calcareous in most places.

Some areas of these soils are subject to flooding and to further deposition of sediment. In most areas the development of soil horizons is slight. In some areas, however, these soils have a dark colored surface layer and a blocky subsoil. Gullies form where the soils are not protected by a vegetative cover. Available water capacity is moderate to high.

The native vegetation commonly consists of adapted shrubs and grasses. These soils are used for range, recreational purposes, and wildlife habitat.

Because annual precipitation is low and has poor seasonal distribution, these soils are not suited to nonirrigated crops. Where native grasses have been depleted or destroyed, however, a high degree of success can be expected from pasture plantings of nonirrigated grasses in spring, late in summer, and in fall to protect the soils from erosion and to provide grazing for livestock. Good management must be practiced to maintain the grasses. Pubescent wheatgrass, tall wheatgrass, and crested wheatgrass are adapted species.

Areas of these soils provide habitat for many kinds of wildlife. They provide cover for ring-necked pheasant that feed in adjacent farmland and nesting sites for mourning dove. Restricting grazing of livestock helps to maintain the quality of wildlife habitat in these areas. Where these soils are suitable for crops, food plots, trees and shrubs, and nesting cover can be established to improve habitat for upland wildlife.

If these soils are used for urban development, the main limitation is the hazard of flooding. This limitation can be overcome by the use of proper design and construction methods.

These soils are in capability subclass VIw, nonirrigated.

37—Fughes loam, 5 to 15 percent slopes. This is a deep, well drained soil. It formed in old alluvial fan and landslide deposits derived from sedimentary rock and is on alluvial fans, valley side slopes, and uplands. Elevation ranges from 6,500 to 8,500 feet. Average annual precipitation is about 18 inches, average annual air temperature is about 42 degrees F, and the average frost-free season is about 100 days.

Typically the surface layer is very dark grayish brown loam about 5 inches thick. The subsoil is dark grayish brown clay loam that grades to reddish brown light clay and is about 39 inches thick. The substratum, to a depth of 60 inches, is light reddish brown clay loam.

Permeability is slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Sur-

face runoff is moderate to rapid. The hazard of erosion from wind is slight and from water is moderate to high.

Included with this soil in mapping are a few small areas of Curecanti, Cochetopa, and Bulkley soils and Cryoborolls, very stony. Small slips and landslides are common. In some areas the entire landmass is moving very slightly.

The native vegetation on this soil consists mainly of oakbrush, serviceberry, Arizona fescue, and western wheatgrass.

Most areas of this soil are used for irrigated crops, mainly hay and pasture. Areas that are not irrigated are used for grazing of livestock and wildlife and for recreational purposes.

This soil is suited to all of the crops commonly grown in the survey area, except those which require a long growing season. Care is necessary to prevent water and wind erosion. Maintaining organic matter content is important. The soil should be kept in grasses, legumes, or close-growing crops at least one-fourth of the time, and row crops in rotation should be grown no more than 3 years consecutively. Use of crop residue, land leveling, good management of irrigation water, and using cover crops and green manure crops help to maintain organic matter content and to control erosion. Shortness of the growing season may limit the choice of crops.

This soil can be used for irrigated pasture and hay crops. It is well suited to alfalfa, smooth brome, orchardgrass, intermediate wheatgrass, and clover. Irrigation can be done by contour ditch, corrugation, and furrow methods.

Because annual precipitation is low and has poor seasonal distribution, this soil is not suited to nonirrigated crops. However, nonirrigated pasture grasses can be planted late in summer and in fall to protect the soil from erosion and to provide grazing for livestock, if good pasture management is practiced. Pubescent wheatgrass, smooth brome, and crested wheatgrass are adapted species.

The potential plant community on this soil consists mainly of wheatgrass, bluegrasses, and needlegrasses. As range condition deteriorates, the wheatgrasses and needlegrasses decrease, forbs and woody shrubs increase, and undesirable weeds and annual plants invade and become more abundant.

Seeding is advisable if range is in poor condition. Bluebunch wheatgrass, western wheatgrass, and big bluegrass are suitable for seeding. Grasses that meet the seasonal requirements of livestock should be selected. Preparing a seedbed and drilling the seed help to obtain the best results. On some sites, control of competing shrubs is required to improve range condition. Seeded areas should be fenced.

This soil is used for winter range by mule deer and elk. Some important plant species which can be managed for optimum production are bitterbrush, mountainmahogany, Gambel oak, serviceberry, and elk sedge. Berry-producing shrubs are an important habitat element of black bear. This soil provides habitat for Merriam turkey, blue grouse, and band-tailed pigeon. In favorable years mature Gambel oaks produce acorns which are used by Merriam turkey.

If this soil is used for urban development, the main limitation is shrink-swell potential. If it is used for septic tank absorption fields, permeability is the main limitation. The limitations can be overcome by the use of proper design and construction methods.

This soil is in capability subclasses IVe, irrigated, and VIe, nonirrigated.

38—Fughes loam, 15 to 25 percent slopes. This is a deep, well drained soil. It formed in old alluvial fan and landslide deposits derived from sedimentary rock and is on alluvial fans, valley side slopes, and uplands. Elevation ranges from 6,500 to 8,500 feet. Average annual precipitation is about 18 inches, average annual air temperature is about 37 degrees F, and the average frost-free season is about 100 days.

Typically the surface layer is very dark grayish brown loam about 5 inches thick. The subsoil is dark grayish brown clay loam that grades to reddish brown light clay and is about 39 inches thick. The substratum, to a depth of 60 inches, is light reddish brown clay loam.

Permeability is slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Surface runoff is rapid. The hazard of erosion from wind is slight and from water is moderate to high.

Included with this soil in mapping are a few small areas of Curecanti, Cochetopa, and Bulkley soils. Also included are outcrops of interbedded sandstone and shale on the steeper slopes. Soil slips can occur in the steeper areas, especially if the area is disturbed.

The native vegetation on this soil consists mainly of oakbrush, serviceberry, Arizona fescue, and western wheatgrass.

Most areas of this soil are used for grazing of livestock and wildlife and for recreational purposes.

Because annual precipitation is low and has poor seasonal distribution, this soil is not suited to nonirrigated crops. Where native grasses have been depleted or destroyed, however, a high degree of success can be expected from pasture plantings of nonirrigated grasses in spring, late in summer, and in fall to protect the soil from erosion and to provide grazing for livestock. Good pasture management must be practiced to maintain the grasses. Crested wheatgrass, pubescent wheatgrass, and smooth brome are adapted species.

The potential plant community on this soil consists of wheatgrasses, bluegrasses, and needlegrasses. As range condition deteriorates, wheatgrasses and needlegrasses decrease, forbs and woody shrubs increase, and undesirable weeds and annual plants invade and become more abundant.

Seeding is advisable where slope is not excessive, if range is in poor condition. Bluebunch wheatgrass, west-

ern wheatgrass, and big bluegrass are suitable for seeding. Grasses that meet the seasonal requirements of livestock should be selected. Preparing a seedbed and drilling the seed help to obtain the best results. On some sites, control of competing shrubs is required to improve range condition. Seeded or brushed areas should be fenced.

This soil is used for winter range by mule deer and elk. Some important plant species which can be managed for optimum production are bitterbrush, mountainmahogany, Gambel oak, serviceberry, and elk sedge. Berry-producing shrubs are an important habitat element of black bear. This soil provides habitat for Merriam turkey, blue grouse, and band-tailed pigeon. In favorable years mature Gambel oaks produce acorns, which are used by Merriam turkey.

If this soil is used for urban development, the main limitations are shrink-swell potential and slope. If it is used for septic tank absorption fields, permeability is the main limitation. The limitations can be overcome by the use of proper design and construction methods.

This soil is in capability subclass VIe, nonirrigated.

39—Fughes loam, 25 to 65 percent slopes. This is a deep, well drained soil. It formed in old alluvial fan and landslide deposits and is on alluvial fans, valley side slopes, and uplands. Elevation ranges from 6,500 to 8,500 feet. Average annual precipitation is about 18 inches, average annual air temperature is about 37 degrees F, and the average frost-free season is about 100 days.

Typically the surface layer is very dark grayish brown loam about 5 inches thick. The subsoil is dark grayish brown clay loam that grades to reddish brown light clay and is about 39 inches thick. The substratum, to a depth of 60 inches, is light reddish brown clay loam.

Permeability is slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Surface runoff is rapid and very rapid. The hazard of erosion from wind is slight and from water is high.

Included with this soil in mapping are a few small areas of Curecanti, Cochetopa, and Bulkley soils and small areas of well drained alluvial land along drainageways. Slips can occur on steeper slopes, especially if the area is disturbed. Interbedded sandstone and shale crop out in some of the steeper areas.

Most areas of this soil are used for grazing of livestock and wildlife and for recreational purposes.

Because of steepness of slope, this soil is unsuited to crops and reseeding of depleted or destroyed native vegetation is not feasible by conventional methods. A fair degree of success can be expected by broadcasting seed of nonirrigated grasses in spring or fall. Pubescent wheatgrass, smooth brome, and crested wheatgrass are adapted grasses. Good pasture management should be practiced to maintain the grasses.

The potential plant community on this soil consists mainly of wheatgrasses, bluegrasses, and needlegrasses. As range condition deteriorates, wheatgrasses and needlegrasses decrease, forbs and woody shrubs increase, and undesirable weeds and annual plants invade and become more abundant.

If range is in poor condition, seed can be broadcast with some success. Bluebunch wheatgrass, western wheatgrass, and big bluegrass are suitable for seeding. Grasses that meet the seasonal requirements of livestock should be selected. On some sites, control of competing shrubs is required to improve range condition. Seeded or brushed areas should be fenced.

This soil is used for winter range by mule deer and elk. Some important plant species which can be managed for optimum production are bitterbrush, mountainmahogany, Gambel oak, serviceberry, and elk sedge. Berry-producing shrubs are an important habitat element of black bear. This soil provides habitat for Merriam turkey, blue grouse, and band-tailed pigeon. In favorable years, mature Gambel oaks produce acorns, which are used by Merriam turkey.

If this soil is used for urban development, the main limitations are shrink-swell potential and slope. If it is used for septic tank absorption fields, permeability is the main limitation. The limitations can be overcome by the use of proper design and construction methods.

This soil is in capability subclass VIIe, nonirrigated.

40—Fughes stony loam, 3 to 30 percent slopes. This is a deep, well drained soil. It formed in old alluvial fan and landslide deposits derived from sedimentary rock and is on alluvial fan, valley side slopes, and uplands. Elevation ranges from 6,500 to 8,500 feet. Average annual precipitation is about 18 inches, average annual air temperature is about 42 degrees F, and the average frost-free season is about 100 days.

Typically the surface layer is very dark grayish brown stony loam about 5 inches thick. The subsoil is dark grayish brown clay loam that grades to reddish brown light clay and is about 39 inches thick. The substratum, to a depth of 60 inches, is light reddish brown clay loam.

Permeability is slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Surface runoff is moderate to rapid. The hazard of erosion from wind is slight and from water is moderate to high.

Included with this soil in mapping are a few small areas of Curecanti and Cochetopa soils and of Cryoborolls, very stony. In some areas the soil is free of stones. Small slips and landslides may be on the steeper slopes, especially in disturbed areas. In some areas the entire landmass is moving slightly.

The native vegetation of this soil consists mainly of oakbrush, serviceberry, Arizona fescue, and western wheatgrass.

Most of this soil is used for grazing of livestock and wildlife and for recreation.

The amount of stone on the surface and the degree of slope make this soil unsuitable for cropland. Seedbed preparation and drilling the seed for pasture plantings on

depleted native range or cleared areas are generally not practical because of the stony surface. A limited degree of success can be expected by broadcasting seed late in summer or early in fall. Siberian and western wheatgrass, Indian ricegrass, and crested wheatgrass are adapted species. Proper pasture use provides protection from erosion and grazing for livestock.

The potential native vegetation on this soil is dominated by wheatgrasses, bluegrasses, and needlegrasses. As range condition deteriorates, the proportions of wheatgrasses and needlegrasses, which are most desirable of the native forage plants, decrease, the proportions of forbs and woody shrubs increase, and undesirable weeds and annual plants invade and become more abundant.

Seeding is advisable if range is in poor condition. Bluebunch wheatgrass, western wheatgrass, and big bluegrass are suitable for seeding. Grasses that meet the seasonal requirements of livestock should be selected. Preparing a seedbed and drilling the seed help to obtain the best results. In areas where more sagebrush is produced than in the potential plant community, control of the competitive shrubs may be required to improve the condition.

This soil is used for winter range by mule deer and elk. Some important plant species which can be managed for optimum production are bitterbrush, mountainmahogany, Gambel oak, serviceberry, and elk sedge. Berry-producing shrubs are an important habitat element of black bear. This soil provides habitat for Merriam turkey, blue grouse, and band-tailed pigeon. In favorable years, mature Gambel oaks produce acorns, which are used by Merriam turkey.

If this soil is used for urban development, the main limitations are shrink-swell potential, stoniness, and slope. If it is used for septic tank absorption fields, permeability is the main limitation. The limitations can be overcome by the use of proper design and construction methods.

This soil is in capability subclass VIIs, nonirrigated.

41—Fughes-Curecanti stony loam, 10 to 40 percent slopes. These strongly sloping to steep soils formed in glacial outwash, landslide deposits, and old alluvial fans. Elevation ranges from 6,500 to 8,500 feet. Average annual precipitation is about 18 inches, average annual air temperature is about 42 degrees F, and the average frost-free season is about 100 days.

The Fughes soil makes up about 40 percent of this complex and is in swales, depressions, and drainageways. The Curecanti soil makes up about 40 percent and is on small ridges and convex side slopes.

Included with these soils in mapping are a few small areas of Cochetopa and Bulkley soils and areas of Cryoborolls, very stony. Slips and slides are common, especially in disturbed areas. The included soils make up 20 percent of the complex.

The Fughes soil is deep and well drained. It formed in old alluvial fans and in landslide deposits derived from sedimentary rock.

Typically the surface layer of the Fughes soil is very dark grayish brown stony loam about 5 inches thick. The subsoil is dark grayish brown clay loam that grades to reddish brown light clay and is about 39 inches thick. The substratum, to a depth of 60 inches, is light reddish brown clay loam.

In the Fughes soil, permeability is slow and available water capacity is high. Effective rooting depth is 60 inches or more. Surface runoff is medium to rapid. The hazard of erosion from wind is slight and from water is high.

On the Fughes soil the native vegetation consists mainly of oakbrush, serviceberry, Arizona fescue, and western wheatgrass.

The Curecanti soil is deep and well drained. It formed in glacial outwash and old landslide deposits.

Typically the surface layer of the Curecanti soil is dark grayish brown stony loam about 13 inches thick. The subsoil is dark brown very gravelly or very cobbly clay loam about 29 inches thick. The substratum, to a depth of 60 inches, is yellowish brown very stony loam.

In the Curecanti soil, permeability and available water capacity are moderate. Effective rooting depth is 60 inches or more. Surface runoff is medium to rapid. The hazard of erosion from wind is slight and from water is moderate to high.

On the Curecanti soil the native vegetation consists mainly of Gambel oak, serviceberry, grasses, and scattered stands of aspen.

Most areas of this complex are used for grazing by livestock and wildlife and for recreational purposes.

The potential plant community of the Fughes soil consists mainly of wheatgrasses, bluegrasses, and needlegrasses. As range condition deteriorates, wheatgrasses and needlegrasses decrease, forbs and woody shrubs increase, and undesirable weeds and annual plants invade and become more abundant.

The potential plant community on the Curecanti soil consists mainly of Gambel oak, mountain brome, nodding brome, slender wheatgrass, and elk sedge. As range condition deteriorates, mountain and nodding brome, slender wheatgrass, and elk sedge decrease, forbs and woody shrubs increase, and undesirable weeds and annual plants invade and become more abundant.

If range is in poor condition, seeding is advisable where slopes are less than 20 percent and where the soils are not stony. Big bluegrass, bluebunch wheatgrass, slender wheatgrass, and western wheatgrass are suitable for seeding. Grasses that meet the seasonal requirements of livestock should be selected. Where possible, preparing a seedbed and drilling the seed help to obtain the best results. Good pasture and range management is needed to maintain the grasses. On some

sites, control of competing shrubs is required to improve range condition. Brush control should be done only where slopes are 20 percent or less. Seeded or brushed areas should be fenced.

The Fughes and Curecanti soils are used for winter range by mule deer and elk. Some important plant species which can be managed for optimum production are bitterbrush, mountainmahogany, Gambel oak, serviceberry, and elk sedge. Berry-producing shrubs are an important habitat element of black bear. This soil provides habitat for Merriam turkey, blue grouse, and band-tailed pigeon. In favorable years, mature Gambel oaks produce acorns, which are used by Merriam turkey.

If these soils are used for urban development, the main limitations are shrink-swell potential, stoniness, and slope. If they are used for septic tank absorption fields, permeability is also a limitation. The limitations can be overcome by the use of proper design and construction methods.

These soils are in capability subclass VIIs, nonirrigated.

42—Glenton fine sandy loam, 0 to 3 percent slopes. This is a deep, well drained soil. It formed in recent alluvium and is on fans and low terraces. Elevation ranges from 4,800 to 6,000 feet. Average annual precipitation is about 9 inches, average annual air temperature is about 51 degrees F, and the average frost-free season is about 135 days.

Typically the surface layer is light brownish gray fine sandy loam about 5 inches thick. The underlying material, to a depth of 60 inches, is light brownish gray fine sandy loam.

Permeability is moderately rapid and available water capacity is moderate. Effective rooting depth is 60 inches or more. Surface runoff is slow. The hazard of erosion from wind and water is moderate.

Included with this soil in mapping are a few small areas of Billings and Uffens soils. Also included are areas that have a loam surface layer. Some small areas of Fluvents, Haplaquolls, and Aquic Natrargids are also included.

The native vegetation on this soil consists mainly of Gardner saltbush, bud sagebrush, and shadscale. Galleta, Indian ricegrass, and needleandthread are common grasses.

About half of the acreage of this soil is used for grazing of livestock and wildlife and for recreational purposes. Some areas are used for irrigated crops, mainly row crops, small grains, and alfalfa. Some areas are used for orchard crops.

This soil is suited to all of the crops commonly grown in the survey area, including those which require a long growing season. It can be used for continuous row crops. Care is needed to prevent wind and water erosion. Moisture intake rate is high, and the soil is easy to work. Because of lowered moisture-holding capacity, frequent application of irrigation water is required. Land leveling, good management of irrigation water, and use of crop residue help to conserve irrigation water, control erosion, and maintain organic matter content. Use of green manure crops, rotation of grasses and legumes, and minimum tillage also help to maintain organic matter content and reduce loss of moisture.

This soil can be used for irrigated pasture and hay crops. It is well suited to smooth brome, orchardgrass, intermediate wheatgrass, alfalfa, and clover. Irrigation can be done by contour ditch, corrugation, and furrow methods.

Because annual precipitation is low and has poor seasonal distribution, this soil is unsuited to nonirrigated crops. However, nonirrigated pasture grasses can be planted late in summer and in fall to protect the soil from erosion and to provide grazing for livestock. Siberian wheatgrass, Russian wildrye, and crested wheatgrass are adapted species.

The potential plant community on this soil consists mainly of Indian ricegrass, needleandthread, bluebunch wheatgrass, and big sagebrush. As range condition deteriorates, Indian ricegrass, needleandthread, and bluebunch wheatgrass decrease, forbs and woody shrubs increase, and undesirable weeds and annual plants invade and become more abundant.

Seeding is advisable if range is in poor condition. Indian ricegrass, needleandthread, and sand dropseed are suitable for seeding. Grasses that meet the seasonal requirements of livestock should be selected. Preparing a seedbed and drilling the seed help to obtain the best results. Seeded areas should be fenced.

This soil provides habitat for pronghorn antelope, desert cottontail, and mourning dove. Where water is available, water developments and food plots can be used to improve wildlife habitat. Where this soil is used for irrigated crops, a conservation cropping system that includes grain crops can be used to improve habitat for ring-necked pheasant. A food supply and nesting cover are important habitat elements required by pheasant.

This soil is well suited to most of the orchard crops grown in the survey area. The principal orchard crops grown on this soil are apples, peaches, cherries, and pears. Cover crops are needed to prevent erosion but should be managed so that they do not compete with fruit trees. Application of fertilizer promotes the growth of trees and the production of high quality fruit. Fertilizer requirements should be based on soil or foliage analysis. An intensive spray program is generally needed to control insects and disease.

If this soil is used for urban development, the main limitation is the hazard of flooding.

This soil is in capability subclasses IIe, irrigated, and VIIe, nonirrigated.

43—Glenton loam, 3 to 6 percent slopes. This is a deep, well drained soil. It formed in recent alluvium and is on fans and terraces. Elevation ranges from 4,800 to 6,000 feet. Average annual precipitation is about 9

inches, average annual air temperature is about 51 degrees F, and the average frost-free season is about 135 days.

Typically the surface layer is light brownish gray loam about 5 inches thick. The underlying material, to a depth of 60 inches, is light brownish gray fine sandy loam.

Permeability is moderately rapid, and available water capacity is high. Effective rooting depth is 60 inches or more. Surface runoff is medium. The hazard of erosion from wind and water is moderate.

Included with this soil in mapping are a few small areas of Billings, Glenton, and Uffens soils. In some areas the surface layer is sandy loam. Stone fragments are on the surface in some places.

The native vegetation on this soil consists mainly of Gardner saltbush, bud sagebrush, and shadscale. Galleta, Indian ricegrass, and needleandthread are common grasses.

About half of the acreage of this soil is used for grazing of livestock and wildlife and for recreational purposes. Some areas are used for irrigated crops, mainly row crops, small grains, and alfalfa. Some areas are used for orchard crops.

This soil is suited to all of the crops commonly grown in the survey area, including those which require a long growing season. Moisture intake is moderate, and the soil is easy to work. Special care is needed to prevent water erosion. Maintaining organic matter content is important. This soil should be kept in legumes, grasses, or close-growing crops at least one-fourth of the time. Row crops can be grown for about 3 years consecutively. Land leveling, use of crop residue, and good management of irrigation water help to conserve irrigation water, maintain organic matter content, and control erosion. Minimum tillage and use of green manure crops help to conserve moisture and to maintain organic matter content.

This soil can be used for irrigated pasture and hay crops. It is well suited to smooth brome, orchardgrass, tall wheatgrass, alfalfa, and clover. Irrigation can be done by contour ditch and corrugation methods.

Because annual precipitation is low and has poor seasonal distribution, this soil is not suited to nonirrigated crops. However, nonirrigated pasture grasses can be planted late in summer and in fall to protect the soil from erosion and to provide limited grazing for livestock, if good pasture management is practiced. Siberian wheatgrass and crested wheatgrass are adapted species.

The potential plant community on this soil consists mainly of galleta, Indian ricegrass, Gardner saltbush, and shadscale. As range condition deteriorates, galleta and Indian ricegrass decrease, forbs and woody shrubs increase, and undesirable weeds and annual plants invade and become more abundant.

Seeding is advisable if range is in poor condition. Best results can be expected from sand dropseed, Indian ricegrass, and thickspike wheatgrass. Irrigation may be required in newly seeded areas until the plants are established. Preparing a seedbed and drilling the seed help to obtain the best results. Grasses that meet the seasonal requirements of livestock should be selected.

This soil provides habitat for pronghorn antelope, desert cottontail, and mourning dove. Where water is available, water developments and food plots can be used to improve wildlife habitat. Where this soil is used for irrigated crops, use of a conservation cropping system that includes grain crops can be used to improve habitat for ring-necked pheasant. A food supply and nesting cover are important habitat elements required by pheasant.

This soil is well suited to most of the orchard crops grown in the survey area. The principal orchard crops grown on this soil are apples, peaches, cherries, and pears. Cover crops are needed to prevent erosion but should be managed so that they do not compete with fruit trees. Application of fertilizer promotes the growth of trees and the production of high quality fruit. Fertilizer requirements should be based on soil or foliage analysis. An intensive spray program is generally needed to control insects and disease.

If this soil is used for urban development, the main limitation is a hazard of flooding.

This soil is in capability subclasses IIIe, irrigated, and VIIe, nonirrigated.

44—Gullied land. This miscellaneous area is in areas scattered throughout the central part of the survey areas. It is along flood plains of narrow drainageways. Surface runoff from surrounding areas accumulates and cuts deep channels. Because the soil material is unstable, gullies form readily.

Gullied land has little value for farming but is suited to wildlife habitat, recreational activities, and very limited grazing. Cottontail, racoons, and other small animals use Gullied land as a source of cover and food. Ring-necked pheasant use these areas for cover and feed in adjacent farmland. Gullies hinder the movement of livestock.

If this map unit is used for urban development, the main limitations are susceptibility to flooding and irregular slopes. These limitations may be difficult or impractical to overcome.

This unit is in capability subclass VIIe, nonirrigated.

45—Haplaquolls, flooded. The somewhat poorly drained and poorly drained soils in this broadly defined unit are on low terraces and flood plains adjacent to stream channels. Slopes range from 0 to 6 percent. These soils vary widely in texture, degree of mottling, and depth to the water table.

The surface layer ranges from fine sandy loam to gravelly loamy fine sand. The underlying layers commonly are gravelly and stratified sand, gravel, and cobbles are at a depth of 20 to 40 inches. In some areas cobbles and gravel are on or near the surface.

Depth to the water table fluctuates and is strongly influenced by water level in the adjacent stream. The

water table is at or near the surface during part of the year. This map unit is subject to rare or occasional flooding (fig. 3).

The native vegetation consists mainly of willow, cottonwood, and water-tolerant vegetation.

Some areas of this map unit are suited to adapted crops except those which require a long growing season. Hay, small grains, pasture, orchard crops, and some row crops can be grown.

Because annual precipitation is low and has poor seasonal distribution, these soils are unsuited to nonirrigated crops. However, nonirrigated pasture grasses can be planted late in summer and in fall to protect the soil from erosion and to provide grazing for livestock. Siberian wheatgrass, western wheatgrass, and Indian ricegrass are adapted species.

These soils are also suited to Fremont cottonwood. They can produce 7,000 board feet per acre (Doyle rule) of merchantable timber in a fully stocked stand of even-aged trees that are 40 years old. The main limitations to the use of these soils for trees are susceptibility to flooding and the high water table.

Areas of this map unit provide habitat for many kinds of wildlife. Ring-necked pheasant use these areas for cover and feed in adjacent farmland, and mourning dove nest in the cottonwoods and tamarisk that grow in the areas. Restricting grazing of livestock helps to maintain quality of wildlife habitat. Where these soils are suitable for crops, establishment of food plots, tree and shrub plantings, and nesting cover helps to improve habitat for upland wildlife. Where the water table is high, open water areas can be developed by blasting or use of heavy equipment to improve habitat for waterfowl and shorebirds.

If these soils are used for urban development, the main limitations are susceptibility to flooding and depth to the water table. These limitations can be overcome by the use of proper design and construction methods.

These soils are in capability subclasses IIIe, irrigated, and VIw, nonirrigated.

46—Kech-Progresso loams, 3 to 15 percent slopes. These gently sloping to strongly sloping soils are on hills and ridges in uplands. Elevation ranges from 5,500 to 7,600 feet. Average annual precipitation is about 14 inches, average annual air temperature is about 44 degrees F, and the frost-free season is about 115 days.

The Kech soil makes up about 40 percent of this complex and is on small ridges and in more sloping areas. The Progresso soil makes up about 40 percent and is in depressions and in less sloping areas.

Included with these soils in mapping are a few small areas of Potts, Lazear, and Shavano soils and small areas where bedrock is exposed. Included areas make up about 20 percent of the map unit. In some areas the surface layer is sandy loam or clay loam or is channery.

The Kech soil is shallow and well drained and overlies bedrock at a depth of 10 to 20 inches. It formed in place and in locally transported sediment derived from sandstone and interbedded shale.

Typically the surface layer of the Kech soil is brown loam about 4 inches thick. The subsoil is brown clay loam about 15 inches thick. Sandstone is at a depth of about 19 inches.

In the Kech soil, permeability is moderately slow and available water capacity is low. Effective rooting depth is about 19 inches. Surface runoff is medium to rapid. The hazard of erosion from wind is slight and from water is moderate.

On the Kech soil the native vegetation consists mainly of pinyon, juniper, and big sagebrush. Wheatgrasses, Junegrass, Indian ricegrass, and squirreltail are the principal grasses.

The Progresso soil is moderately deep and well drained and overlies sandstone bedrock at a depth of 20 to 40 inches. It formed in place and in locally transported sediments derived from sandstone and interbedded shale.

Typically the surface layer of the Progresso soil is pinkish gray loam about 5 inches thick. The subsoil is brown clay loam about 17 inches thick. The substratum is white channery loam. Sandstone is at a depth of about 30 inches.

In the Progresso soil, permeability is moderate and available water capacity is moderate. Effective rooting depth is about 30 inches. Surface runoff is medium. The hazard of erosion from wind is slight and from water is moderate.

On the Progresso soil the native vegetation consists of big sagebrush and scattered pinyon and juniper. Wheatgrasses, Junegrass, Indian ricegrass, and squirreltail are the principal grasses.

About half of the acreage of this complex is in noncommercial woodland and is used for limited grazing by livestock and wildlife (fig. 4) and for recreational purposes. Some areas are used for irrigated crops, mainly hay, small grains, and pasture. Some areas are used for orchard crops.

The Kech soil is suited to Utah juniper and pinyon pine. It can produce 11 cords per acre in a stand in which the tree trunks have an average diameter of 5 inches at a height of one foot. Low available water capacity is the only limitation and can inhibit survival of seedlings.

The potential plant community on the Progresso soil consists mainly of bluebunch wheatgrass, Junegrass, western wheatgrass, Indian ricegrass, galleta, needleandthread, and squirreltail. As range condition deteriorates, wheatgrasses, Indian ricegrass, Junegrass, and needleandthread decrease, forbs and woody shrubs increase, and undesirable weeds and annual plants invade and become more abundant.

Seeding is advisable on these soils if range is in poor condition. Western wheatgrass, bluebunch wheatgrass, Indian ricegrass, and needleandthread are suitable for

seeding. Grasses that meet the seasonal requirements of livestock should be selected. Preparing a seedbed and drilling the seed help to obtain the best results. Good pasture and range management is needed to maintain the grasses.

Areas of this complex are used for winter range by mule deer. Big sagebrush, mountainmahogany, and bitterbrush are important browse species which can be managed for optimum production. These soils have limited potential for habitat for blue grouse. Encouragement of pinyon and juniper on suitable sites can lead to establishment of a browse-grass plant community beneficial to livestock and mule deer. The cover provided by pinyon and juniper trees is a vital habitat requirement of mule deer and should be considered in management.

These soils are best suited to pasture and hay crops if they are irrigated, because the Kech soil is shallow and has low available water capacity. Extreme care is needed to prevent water erosion. These soils should be kept in grasses at all times except during renovation of pasture. Good management of irrigation water, land leveling, and good management of pasture and hayland are needed to control erosion and to maintain organic matter content. Chiseling can be used to increase water intake rate and available water capacity on the Kech soil and to increase the rooting depth. Frequent and light application of irrigation water is needed on the Kech soil because of its low available water capacity. Length of the growing season may limit yields. These soils are well suited to smooth brome, orchardgrass, and intermediate wheatgrass. They are suited to alfalfa and other deep-rooted plants except where soil depth is not adequate. Irrigation can be done by contour ditch, furrow, and corrugation methods.

If these soils are used for urban development, the main limitation is depth to bedrock. If they are used for septic tank absorption fields, permeability is the main limitation. The limitations can be overcome by the use of proper design and construction methods.

These soils are in capability subclasses IVe, irrigated, and VIe, nonirrigated.

47—Kech-Rock outcrop complex, 10 to 40 percent slopes. These moderately steep to hilly soils are on hills and ridges in uplands. Elevation ranges from 5,500 to 7,600 feet. Average annual precipitation is about 14 inches, average annual air temperature is about 44 degrees F, and the average frost-free season is about 115 days.

The Kech soil makes up about 60 percent of this complex and is on steep side slopes and escarpments. The Rock outcrop part makes up about 20 percent and is on canyon walls or escarpments on mesas and benches.

Included with this complex in mapping are a few small areas of Progresso, Lazear, and Shavano soils and deep, stony soils. The included soils make up 20 percent of this complex.

The Kech soil is shallow and well drained and overlies bedrock at a depth of 10 to 20 inches. It formed in residuum and in locally transported sediment derived from sandstone and interbedded shale.

Typically the surface layer of the Kech soil is brown loam about 4 inches thick. The subsoil is brown clay loam about 15 inches thick. Sandstone is at a depth of about 19 inches.

On the Kech soil, permeability is moderately slow and available water capacity is low. Effective rooting depth is about 19 inches. Surface runoff is rapid. The hazard of erosion from wind is slight and from water is high.

On the Kech soil the native vegetation consists mainly of pinyon, juniper, and big sagebrush. Wheatgrasses, Junegrass, Indian ricegrass, and squirreltail are the principal understory grasses.

Because annual precipitation is low and has poor seasonal distribution, and because available water capacity is low, the Kech soil is not suited to crops. However, nonirrigated pasture grasses can be planted late in summer and in fall to protect the soil from erosion and to provide limited grazing for livestock. Siberian wheatgrass, western wheatgrass, and Indian ricegrass are adapted species.

The Kech soil is suited to Utah juniper and pinyon pine. It can produce 11 cords per acre in a stand in which tree trunks have an average diameter of 5 inches at a height of one foot. Presence of rock outcrop and the hazard of erosion are limitations. The presence of rock outcrop hinders equipment operations. Special attention must be given to minimize erosion during harvesting operations. The low available water capacity of the Kech soil can inhibit seedling survival.

The Kech soil is used for winter range by mule deer. Key species for winter forage included big sagebrush, mountainmahogany, and bitterbrush. The Kech soil has limited potential for habitat for blue grouse.

The cover provided by pinyon and juniper trees is a vital habitat requirement of mule deer and should be considered in management.

If the Kech soil is used for urban development, the main limitations are depth to bedrock and slope. If this soil is used for septic tank absorption fields, permeability is the main limitation. The limitations can be overcome by the use of proper design and construction methods.

The Rock outcrop part of this complex consists of more than 90 percent exposed bedrock, mainly sandstone, shale, and intrusive and extrusive igneous rock. Rock outcrop provides cover for wildlife and enhances the scenic value of the landscape. It is used mainly for wildlife habitat and recreational purposes.

This complex is in capability subclass VIIe, nonirrigated.

48—Killpack silty clay loam, 3 to 12 percent slopes. This is a moderately deep, well drained soil that overlies silty calcareous shale at a depth of 20 to 40 inches. This soil formed in material weathered from

shale and is on fans and upland side slopes. Elevation ranges from 4,800 to 6,000 feet. Average annual precipitation is about 10 inches, average annual air temperature is about 50 degrees F, and the average frost-free season is about 135 days.

Typically the surface layer is light yellowish brown silty clay loam about 6 inches thick. The upper part of the underlying material is light yellowish brown silty clay loam about 6 inches thick and the lower part is light gray silty clay loam 14 inches thick. Soft, weathered shale is at a depth of about 26 inches.

Permeability is slow, and available water capacity is low. Effective rooting depth is about 26 inches. Surface runoff is rapid. The hazard of erosion from wind is slight and from water is high.

Included with this soil in mapping are a few small areas of Chipeta, Persayo, and Billings soils. Also included are soils that have a surface layer of heavy silt loam and light silty clay. In many areas the surface layer is gravelly or cobbly. Gullies and rills are common in the more sloping areas.

The native vegetation on this soil consists mainly of fourwing saltbush, shadscale, snakeweed, and greasewood. Galleta, Indian ricegrass, and western wheatgrass are common grasses.

Most areas of this soil are used for grazing of livestock and wildlife and for recreational purposes. Some areas are used for irrigated crops, mainly small grains, pasture, and hay.

This soil is suited to all of the crops commonly grown in the survey area, including those which require a long growing season. Extreme care is needed to prevent water erosion. The soil should be maintained in legumes, grasses, or close-growing crops at least half of the time. Moisture intake rate is moderate, and the soil is easy to work. Land leveling, good management of irrigation water, and use of crop residue help to conserve irrigation water, control erosion, and maintain organic matter content. Using green manure crops and using grasses and legumes in rotation also help to maintain organic matter content and to control erosion.

This soil can be used for irrigated pasture and hay crops. It is well suited to smooth brome, orchardgrass, tall wheatgrass, alfalfa, and clover. Irrigation can be done by contour ditch, corrugation, and furrow methods.

Because annual precipitation is low and has poor seasonal distribution, this soil is not suited to nonirrigated crops. However, nonirrigated pasture grasses can be planted late in summer and in fall to protect the soil from erosion and to provide grazing for livestock, if proper pasture management is practiced. Siberian wheatgrass and crested wheatgrass are adapted species.

The potential plant community on this soil consists mainly of galleta, Indian ricegrass, and mat saltbush. As range condition deteriorates, Indian ricegrass and galleta decrease, woody shrubs increase, and undesirable weeds and annual plants invade and become more abundant.

Seeding has limited success but may be advisable if range is in poor condition. Best results can be expected from Indian ricegrass and alkali sacaton. Irrigation may be required in newly seeded areas until the plants are established. Preparing a seedbed and drilling the seed help to obtain the best results. Grasses that meet the seasonal requirements of livestock should be selected. Seeded areas should be fenced.

This soil provides habitat for pronghorn antelope, desert cottontail, and mourning dove. Where water is available, water developments and food plots can be used to improve wildlife habitat. Where these soils are used for irrigated crops, a conservation cropping system that includes grain crops helps to improve habitat for ring-necked pheasant. A food supply and nesting cover are important habitat elements required by pheasant.

If this soil is used for urban development, the main limitations are depth to bedrock, low strength, and corrosivity. If it is used for septic tank absorption fields, permeability is the main limitation. These limitations can be overcome by the use of proper design and construction methods.

This soil is in capability subclasses IVe, irrigated, and VIIe, nonirrigated.

49—Lazear-Rock outcrop complex, 3 to 30 percent slopes. The sloping, gently rolling, and moderately steep soils in this complex are on uplands. Elevation ranges from 4,800 to 6,000 feet. Average annual precipitation is about 10 inches, average annual air temperature is about 51 degrees F, and the average frost-free season is about 140 days.

The Lazear soil makes up about 50 percent of this complex. It formed in colluvium and alluvium and is on side slopes between rock escarpments. The Rock outcrop part makes up about 20 percent and is on steep slopes and escarpments.

Included with this complex in mapping are a few small areas of Shavano soils. Also included are some areas of very shallow soils that are less than 10 inches over bedrock and areas of deep, stony soils. The included soils make up 20 percent of the complex. In some areas the surface layer is loam or sandy loam.

The Lazear soil is shallow and well drained and overlies bedrock at a depth of 10 to 20 inches. It formed in material that was weathered in place from sandstone and interbedded shale.

Typically the surface layer of the Lazear soil is light brownish gray gravelly loam about 4 inches thick. The underlying material is light brown gravelly loam. Sandstone is at a depth of about 14 inches.

In the Lazear soil, permeability is moderate and available water capacity is low. Effective rooting depth is about 15 inches. Surface runoff is moderate to rapid. The hazard of erosion from wind is moderate and from water is moderate to high.

On the Lazear soil the native vegetation consists mainly of shadscale, snakeweed, fourwing saltbush, rabbitbrush, galleta, Indian ricegrass, and squirreltail.

Because of steepness of slope, shallow soil depth, and low available water capacity, the Lazear soil is unsuited to crops. Only fair results can be expected from planting grass in areas where slope will permit seedbed preparations and drilling of seed. If established, Russian wildrye, Siberian wheatgrass, and crested wheatgrass help to protect the soil from erosion and to provide very limited grazing for livestock.

The potential plant community on the Lazear soil consists mainly of galleta, western wheatgrass, and shadscale. As range condition deteriorates, galleta and western wheatgrass decrease, forbs and woody shrubs increase, and undesirable weeds and annual plants invade and become more abundant. Good pasture management is needed to maintain the grasses.

The Lazear soil provides for desert cottontail, mourning dove, and chukar. Water developments can be used to improve wildlife habitat on the Lazear soil.

If the Lazear soil is used for urban development, the main limitations are depth to bedrock and slope. The limitations can be overcome by the use of proper design and construction methods.

The Rock outcrop part of this complex consists of more than 90 percent exposed bedrock, mainly sandstone, shale, and intrusive and extrusive igneous rock. Rock outcrop provides cover for wildlife and enhances the scenic value of the landscape. It is used mainly for wildlife habitat and recreational purposes.

This complex is in capability subclass VIIe, nonirrigated.

50—Limon silty clay loam, 0 to 3 percent slopes. This is a deep, well drained soil. It formed in fine textured alluvium. It is nearly level and gently sloping and is on alluvial fans. Elevation ranges from 5,200 to 6,500 feet. Average annual precipitation is about 11 inches, average annual air temperature is about 48 degrees F, and the average frost-free season is about 130 days.

Typically the surface layer is grayish brown silty clay loam about 4 inches thick. The upper part of the underlying material is grayish brown silty clay about 17 inches thick. The lower part, to a depth of 60 inches, is light brownish gray silty clay.

Permeability is slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Surface runoff is slow. The hazard of erosion from wind is slight and from water is moderate.

Included with this soil in mapping are a few small areas of Apishapa, Billings, and Killpack soils. In some areas the surface layer is heavy silt loam or silty clay. Some small areas of saline wetlands and Gullied land are also included. Piping is common in some areas.

The native vegetation on this soil consists mainly of shadscale, Gardner saltbush, and greasewood. Galleta, western wheatgrass, squirreltail, and Indian ricegrass are common grasses.

This soil is used mainly for grazing of livestock and wildlife and for recreational purposes. In some areas it is used for irrigated crops, mainly row crops, small grains, alfalfa, hay, and pasture. Some areas are used for orchard crops.

This soil is suited to most of the crops commonly grown in the survey area, including those which require a long growing season. Moisture intake rate is moderate to slow, and the soil should be worked at the proper moisture content. Care is needed to prevent seepage and salt accumulation. Maintaining the content of organic matter is important. The soil should be kept in legumes, grasses, or close-growing crops at least one-fourth of the time. Row crops can be grown about 3 years consecutively. Land leveling, use of crop residue, and pastureland and hayland plantings help to conserve irrigation water, maintain organic matter content, and control erosion. Minimum tillage and use of green manure crops also help to maintain organic matter content.

This soil can be used for irrigated pasture and hay crops. It is well suited to smooth brome, orchardgrass, tall wheatgrass, alfalfa, and clover. Irrigation can be done by contour ditch, corrugation, and furrow methods.

Because annual precipitation is low and has poor seasonal distribution, this soil is not suited to nonirrigated crops. However, nonirrigated pasture grasses can be planted late in summer and in fall to protect the soil from erosion and to provide limited grazing for livestock, if good pasture management is practiced. Siberian wheatgrass and crested wheatgrass are adapted species.

The potential plant community on this soil consists mainly of saltgrass, alkali sacaton, galleta, western wheatgrass, fourwing saltbush, and greasewood. As range condition deteriorates, alkali sacaton, galleta, western wheatgrass, and fourwing saltbush decrease, forbs and other woody shrubs increase, and undesirable weeds and annual plants invade and become more abundant.

Seeding has limited success but may be advisable if range is in poor condition. Best results can be expected from sand dropseed and western wheatgrass. Irrigation may be required in newly seeded areas until the plants are established. Preparing a seedbed and drilling the seed help to obtain the best results. Grasses that meet the seasonal requirements of livestock should be selected. Seeded areas should be fenced.

Some included areas of poorly drained soils in this map unit have potential for development of wetland wildlife habitat. Open water areas can be developed by blasting or by use of heavy equipment to provide nesting habitat for waterfowl and shorebirds. Inland saltgrass is an important waterfowl food item which occurs naturally in these poorly drained areas.

If this soil is used for urban development, the main limitations are shrink-swell potential, low strength, and

susceptibility to flooding. If it is used for septic tank absorption fields, permeability is also a limitation. The limitations can be overcome by the use of proper design and construction methods.

This soil is in capability subclasses IIIe, irrigated, and VIe, nonirrigated.

51—Limon silty clay loam, 3 to 6 percent slopes. This is a deep, well drained soil. It formed in fine textured alluvuim and is on alluvial fans. Elevation ranges from 5,200 to 6,500 feet. Average annual precipitation is about 11 inches, average annual air temperature is about 48 degrees F, and the average frost-free season is about 130 days.

Typically the surface layer is grayish brown silty clay loam about 4 inches thick. The upper part of the underlying material is grayish brown silty clay about 17 inches thick, and the lower part, to a depth of 60 inches, is light brownish gray silty clay.

Permeability is slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Surface runoff is medium. The hazard of erosion from wind is slight and from water is high.

Included with this soil in mapping are a few small areas of Colona, Billings, and Killpack soils. In some areas the surface layer is heavy silt loam or silty clay. Also included are small areas of Gullied land and saline wetlands and some areas at the head of drainageways where cobbles and stones are on the surface. Piping occurs in some areas.

The native vegetation on this soil consists mainly of shadscale, Gardner saltbush, and scattered clumps of greasewood. Western wheatgrass, galleta, squirreltail, and Indian ricegrass are common grasses.

This soil is used for grazing of livestock and wildlife and for recreational purposes. In some areas this soil is used for irrigated crops, mainly small grains, alfalfa, hay, pasture, and orchard crops.

This soil is suited to all of the crops commonly grown in the survey area, including those which require a very long growing season. Extreme care is needed to prevent water and wind erosion. The soil should be kept in legumes, grasses, or close-growing crops at least one-half of the time. Moisture intake rate is moderate to low, and the soil should be worked at the proper moisture content. Land leveling, good management of irrigation water, and use of crop residue help to conserve irrigation water, control erosion, and maintain organic matter content. Using green manure crops and using grasses and legumes in rotation also help to maintain organic matter content and control erosion.

This soil can be used for irrigated pasture and hay crops. It is well suited to smooth brome, orchardgrass, tall wheatgrass, alfalfa, and clover. Irrigation can be done by contour ditch and corrugation methods.

Because annual precipitation is low and has poor seasonal distribution, this soil is not suited to nonirrigated crops. However, nonirrigated pasture grasses can be planted late in summer and in fall to protect the soil from erosion and to provide limited grazing for livestock, if good pasture management is practiced. Siberian wheatgrass and crested wheatgrass are adapted species.

The potential plant community on this soil consists mainly of saltgrass, alkali sacaton, galleta, western wheatgrass, fourwing saltbush, and greasewood. As range condition deteriorates, alkali sacaton, galleta, western wheatgrass, and fourwing saltbush decrease, forbs and other woody shrubs increase, and undesirable weeds and annual plants invade and become more abundant.

Seeding has limited success but may be advisable if range is in poor condition. Best results can be expected from sand dropseed and western wheatgrass. Irrigation may be required in newly seeded areas until the plants are established. Preparing a seedbed and drilling the seed help to obtain the best results. Grasses that meet the seasonal requirements of livestock should be selected. Seeded areas should be fenced.

Some included areas of poorly drained soils in this map unit have potential for development of wetland wildlife habitat. Open water areas can be developed by blasting or by use of heavy equipment to provide nesting habitat for waterfowl and shorebirds. Inland saltgrass is an important waterfowl food item which occurs naturally in these poorly drained areas.

If this soil is used for urban development, the main limitations are shrink-swell potential, low strength, and susceptibility to flooding. If this soil is used for septic tank absorption fields, permeability is the main limitation. The limitations can be overcome by the use of proper design and construction methods.

This soil is in capability subclasses IVe, irrigated, and VIe, nonirrigated.

52—Meeteetse stony loam, 3 to 20 percent slopes. This is a deep, well drained soil. It formed in stony outwash alluvium and is on old alluvial fans, terraces, and upland side slopes. Elevation ranges from 4,900 to 6,000 feet. Average annual precipitation is about 10 inches, average annual air temperature is about 51 degrees F, and the average frost-free season is about 135 days.

Typically the surface layer is pink stony loam about 2 inches thick. The subsoil is brown gravelly heavy clay loam or light brown stony clay about 14 inches thick. The substratum, to a depth of 60 inches, is light stony heavy clay loam. The content of basalt cobbles and stone ranges from 15 to 35 percent in the surface layer and throughout the profile.

Permeability is slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Surface runoff is medium to rapid. The hazard of erosion from wind is slight and from water is moderate to high.

Included with this soil in mapping are a few small areas of Utaline, Mesa, and Persayo soils. The surface layer is loam or sandy loam in some small areas.

The native vegetation on this soil consists mainly of shadscale, mat saltbush, Gardner saltbush, and greasewood. Galleta, Indian ricegrass, and squirreltail are common grasses.

Most areas of this soil are used for grazing of livestock and wildlife and for recreational purposes.

Because of surface stoniness and slope, this soil is unsuited to crops. Seedbed preparation and drilling of seed for pasture plantings on depleted native range generally are not practical because of surface stoniness. A limited degree of success can be expected by broadcasting seed late in summer or early in fall. Siberian wheatgrass and crested wheatgrass are adapted species. Good pasture management must be practiced to protect the soil from erosion and to provide grazing for livestock.

The potential plant community on this soil consists mainly of galleta, Indian ricegrass, and shadscale. As range condition deteriorates, galleta and Indian ricegrass decrease, forbs and woody shrubs increase, and undesirable weeds and annual plants invade and become more abundant.

Seeding is advisable in some areas if range is in poor condition. Seeding is limited to areas where the surface is not stony. Best results can be expected from Indian ricegrass and galleta. Irrigation may be required in newly seeded areas until the plants are established. Preparing a seedbed and drilling the seed help to obtain the best results. Grasses that meet the seasonal requirements of livestock should be selected. Seeded areas should be fenced.

This soil provides habitat for pronghorn antelope, desert cottontail, and mourning dove. Where water is available, water developments and food plots can be used to improve wildlife habitat. Fourwing saltbush is an important wildlife plant that can be established on this soil.

If this soil is used for urban development, the main limitations are shrink-swell potential, stoniness, and corrosivity. If it is used for septic tank absorption fields, permeability is the main limitation. The limitations can be overcome by the use of proper design and construction methods.

This soil is in capability subclass VIIs, nonirrigated.

53—Mesa loam, 0 to 3 percent slopes. This is a deep, well drained soil. It formed in cobbly alluvium and is on old, high terraces, mesas, and benches. Elevation ranges from 4,800 to 6,000 feet. Average annual precipitation is about 10 inches, average annual air temperature is about 51 degrees F, and the average frost-free season is about 140 days.

Typically the surface layer is light brown loam about 4 inches thick. The subsoil is brown light clay loam about 16 inches thick. The substratum, to a depth of 60 inches, is pinkish white, gravelly or very gravelly loam. A layer of strong lime accumulation that is mixed with cobbles and gravel is in the lower part of the profile.

Permeability is moderate, and available water capacity is high. Effective rooting depth is 60 inches or more. Surface runoff is slow. The hazard of erosion from wind and water is slight.

Included with this soil in mapping are a few small areas of Cliffdown and Avalon soils. In places, the surface layer is gravelly, stony, or cobbly loam or sandy loam.

The native vegetation on this soil consists mainly of shadscale, Gardner saltbush, and big sagebrush. Galleta, squirreltail, and needleandthread are common grasses.

About half the acreage of this soil is used for grazing of livestock and wildlife and for recreational purposes. Some areas are used for irrigated crops, mainly hay, small grains, row crops, and pasture (fig. 5). Some areas are used for orchard crops.

This soil is suited to all of the crops commonly grown in the survey area, including those which require a long growing season. Care is needed to prevent water erosion. The soil can be kept in continuous row crops if crop residue is used to maintain an adequate organic matter content, and if good management of irrigation water and land leveling are used to control erosion. Minimum tillage and the use of cover crops and green manure crops also help to maintain organic matter content and control erosion.

This soil can be used for irrigated pasture and hay crops. It is well suited to smooth brome, orchardgrass, tall wheatgrass, alfalfa, and clover. Irrigation can be done by contour ditch, corrugation, and furrow methods.

Because annual precipitation is low and has poor seasonal distribution, this soil is not suited to nonirrigated crops. However, nonirrigated pasture grasses can be planted late in summer and in fall to protect the soil from erosion and to provide limited grazing for livestock, if good pasture management is practiced. Siberian and crested wheatgrass are adapted species.

The potential plant community on this soil consists mainly of galleta, Indian ricegrass, Gardner saltbush, and shadscale. As range condition deteriorates, galleta and Indian ricegrass decrease, forbs and woody shrubs increase, and undesirable weeds and annual plants invade and become more abundant.

Seeding is advisable if range is in poor condition. Best results can be expected from sand dropseed, Indian ricegrass, and thickspike wheatgrass. Irrigation may be required in newly seeded areas until the plants are established. Preparing a seedbed and drilling the seed help to obtain the best results. Grasses that meet the seasonal requirements should be selected. Seeded areas should be fenced.

This soil provides habitat for pronghorn antelope, desert cottontail, and mourning dove. Where water is available, water developments and food plots can be used to improve wildlife habitat. Where this soil is used for irrigated crops, a conservation cropping system that includes grain crops improves habitat for ring-necked

pheasant. A food supply and nesting cover are important habitat elements required by pheasant.

This soil is well suited to most of the orchard crops grown in the survey area. The principal orchard crops grown on this soil are apples, peaches, pears, and cherries. Cover crops are necessary to control erosion but should be managed so that they do not compete with fruit trees. Application of fertilizer promotes the best growth of trees and the production of high quality fruit. Fertilizer requirements should be based on soil or foliage analysis. An intensive spray program is generally needed to control insects and disease. Estimated average yields per acre for some orchard crops are as follows: apples, 850 bushels; peaches, 650 bushels; cherries, 850 bushels; and pears, 600 bushels.

If this soil is used for urban development, the main limitations are small stones and corrosivity. The limitations can be overcome by the use of proper design and construction methods.

This soil is in capability subclasses IIe, irrigated, and VIIe, nonirrigated.

54—Mesa loam, 3 to 6 percent slopes. This is a deep, well drained soil. It formed in cobbly alluvium and is on old, high terraces, mesas, and benches. Elevation ranges from 4,800 to 6,000 feet. Average annual precipitation is about 10 inches, average annual air temperature is about 51 degrees F, and the average frost-free season is about 140 days.

Typically the surface layer is light brown loam about 4 inches thick. The subsoil is brown light clay loam about 16 inches thick. The substratum, to a depth of 60 inches, is pinkish white, gravelly or very gravelly loam. A layer of strong lime accumulation that is mixed with cobbles and gravel is in the lower part of the profile.

Permeability is moderate, and available water capacity is high. Effective rooting depth is 60 inches or more. Surface runoff is medium. The hazard of erosion from wind is slight and from water is moderate.

Included with this soil in mapping are a few small areas of Cliffdown and Avalon soils. In some places the surface layer is gravelly, cobbly, or stony loam or sandy loam.

The native vegetation on this soil consists mainly of shadscale, Gardner saltbush, and big sagebrush. Galleta, squirreltail, and needleandthread are common grasses.

About half the acreage of this soil is used for grazing of livestock and wildlife and for recreational purposes. Some areas are used for irrigated crops, mainly hay, small grains, row crops, pasture, and orchard crops.

This soil is suited to most of the crops commonly grown in the survey area, including those which require a long growing season. Moisture intake rate is slow, and the soil should be worked at the proper moisture content. Special care is needed to prevent water erosion. Maintaining the content of organic matter is important. The soil should be kept in legumes, grasses, or close-growing crops at least one-fourth of the time. Row crops can be grown for about 3 years consecutively. Land leveling, use of crops residue, and good management of irrigation water help to conserve irrigation water, maintain organic matter content, and control erosion. Minimum tillage and the use of green manure crops also help to maintain organic matter content.

This soil can be used for irrigated pasture and hay crops. It is suited to smooth brome, orchardgrass, tall wheatgrass, alfalfa, and clover. Irrigation can be done by contour ditch and corrugation methods.

Because annual precipitation is low and has poor seasonal distribution, this soil is unsuited to nonirrigated crops. However, nonirrigated pasture grasses can be planted late in summer and in fall to protect the soil from erosion and to provide limited grazing for livestock, if good pasture management is practiced. Siberian wheatgrass and crested wheatgrass are adapted species.

The potential plant community on this soil consists mainly of galleta, Indian ricegrass, Gardner saltbush, and shadscale. As range condition deteriorates, galleta and Indian ricegrass decrease, forbs and woody shrubs increase, and undesirable weeds and annual plants invade and become more abundant.

Seeding is advisable if range is in poor condition. Best results can be expected from sand dropseed, Indian ricegrass, and thickspike wheatgrass. Irrigation may be required in newly seeded areas until the plants are established. Preparing a seedbed and drilling the seed help to obtain the best results. Grasses that meet the seasonal requirements of livestock should be selected. Seeded areas should be fenced.

This soil provides habitat for pronghorn antelope, desert cottontail, and mourning dove. Where water is available, water developments and food plots can be used to improve wildlife habitat. Where these soils are used for irrigated crops a conservation cropping system that includes grain crops improves habitat for ring-necked pheasant. A food supply and nesting cover are important habitat elements required by pheasant.

This soil is well suited to most of the orchard crops grown in the survey area. The principal orchard crops grown on this soil are apples, peaches, pears, and cherries. Cover crops are necessary to control erosion but should be managed so that they do not compete with fruit trees. Application of fertilizer promotes the best growth of trees and the production of high quality fruit. Fertilizer requirements should be based on soil or foliage analysis. An intensive spray program is generally needed to control insects and disease. Estimated average yields per acre for some orchard crops are as follows: apples, 800 bushels; peaches, 600 bushels; cherries, 800 bushels; and pears, 550 bushels.

If this soil is used for urban development, the main limitations are the presence of small stones and corrosivity. The limitations can be overcome by the use of proper design and construction methods.

This soil is in capability subclasses IIIe, irrigated, and VIIe, nonirrigated.

55—Mesa-Utaline stony loams, 3 to 12 percent slopes. These gently sloping to strongly sloping soils are on valley-filling side slopes, old terraces, and mesas. Elevation ranges from 4,800 to 6,200 feet. Average annual precipitation is about 10 inches, average annual air temperature is about 50 degrees F, and the average frost-free season is about 130 days.

The Mesa soil makes up about 50 percent of this complex and is in the less sloping areas. The Utaline soil makes up about 30 percent and is on the more sloping side slopes and on small ridges.

Included with these soils in mapping are a few small areas of Avalon, Agua Fria, Meeteetse, and Saraton soils. Also included are areas of gravelly and cobbly soils. The soils commonly are stony throughout, and the content of stones increases with depth. Included soils make up 20 percent of the map unit.

The Mesa soil is deep and well drained. It formed in old landslide deposits and glacial outwash of mixed origin.

Typically the surface layer of the Mesa soil is light brown stony loam about 4 inches thick. The subsoil is light brown clay loam about 16 inches thick. The substratum, to a depth of 60 inches, is pinkish white, gravelly or very gravelly loam.

In the Mesa soil, permeability is moderate and available water capacity is high. Effective rooting depth is 60 inches or more. Surface runoff is medium. The hazard of erosion from wind is slight and from water is moderate.

On the Mesa soil the native vegetation consists mainly of shadscale, fourwing saltbush, big sagebrush, galleta, Indian ricegrass, western wheatgrass, and annual weeds.

The Utaline soil is deep and well drained. It formed in old landslide deposits and in glacial outwash mixed with basalt.

Typically the surface layer of the Utaline soil is pink stony loam about 4 inches thick. The upper part of the underlying material is pink very cobbly loam about 5 inches thick, and the lower part, to a depth of 60 inches, is pink very cobbly loam and pinkish white or pinkish gray extremely cobbly loam.

In the Utaline soil, permeability is moderate and available water capacity is low. Effective rooting depth is 60 inches or more. Surface runoff is rapid. The hazard of erosion from wind is slight and from water is moderate.

On the Utaline soil the native vegetation consists mainly of shadscale, bud sagebrush, Gardner saltbush, and adapted grasses.

A small acreage of this complex is used for grazing by livestock and wildlife and for recreational purposes. Some areas are used for irrigated crops, mainly hay and pasture crops, small grains, and orchard crops.

The Mesa and Utaline soils are suited to all adapted crops including those which require a long growing season. Because of surface stoniness, however, clearing or rock picking is required so that the soil can be filled. Extreme care is needed to prevent water erosion. Maintaining the content or organic matter is important. Moisture intake rate of the surface layer of these soils is moderate and moderately slow. The soils are easy to till after stones and cobbles have been removed. These soils should be kept in grasses, legumes, or close-growing crops at least one-fourth of the time, and row crops in rotation should be grown no more than 3 years consecutively. Good management of irrigation water and land leveling help to conserve irrigation water and to control erosion. Minimum tillage and the use of cover crops and green manure crops help to maintain organic matter content and control erosion.

These soils are used for range, recreation, and wildlife. With irrigation water they are suited to all adapted crops. Rock picking may be required before a suitable irrigation system can be installed. Irrigation can be done by contour ditch, corrugation, and furrow methods.

These soils are suited to most of the orchard crops grown in the survey area. Apples, cherries, peaches, and pears are the prinicpal orchard crops grown on these soils. Stoniness hinders operation of farm machinery, and the removal of stones is a common practice. Because air drainage is poor, frost can cause severe damage to crops in spring. Cover crops are needed to control erosion but should be managed so that they do not compete with fruit trees. Application of fertilizer promotes the best growth of trees and the production of high quality fruit. Fertilizer requirements should be based on soil or foliage analysis. An intensive spray program is generally needed to control insects and disease.

Because annual precipitation is low and has poor seasonal distribution, these soils are not suited to nonirrigated crops. Stones and cobbles on the surface interfere with cultivation. Nonirrigated pasture grasses can be planted late in summer and in fall to protect the soil from erosion and to provide limited grazing for livestock, if proper pasture management is practiced. Siberian wheatgrass, Russian wildrye, and crested wheatgrass are adapted species. Seeding may be impractical because of surface stoniness.

The potential plant community on these soils consists mainly of galleta, Indian ricegrass, and shadscale. As range condition deteriorates, galleta and Indian ricegrass decrease, forbs and woody shrubs increase, and undesirable weeds and annual plants invade and become more abundant.

Seeding is advisable if range is in poor condition but should be limited to areas that are not stony on the surface. Best results can be expected from Indian ricegrass and galleta. Irrigation may be required in newly seeded areas until the plants are established. Preparing a seedbed and drilling the seed help to obtain the best results. Grasses that meet the seasonal requirements of livestock should be selected. Good pasture and range management is needed to maintain the grasses.

These soils provide habitat for pronghorn antelope, desert cottontail, and mourning dove. Wildlife habitat can be improved by establishment of wildlife water developments and food plots in areas where water is available. Fourwing saltbush, a plant important to wildlife, can be established on these soils.

If these soils are used for urban development, the main limitations are stoniness and corrosivity. The limitations can be overcome by the use of proper design and construction methods.

These soils are in capability subclasses Vs, irrigated, and VIIs, nonirrigated.

56—Midway-Gaynor silty clay loams, 10 to 40 percent slopes. These soils are strongly sloping, hilly, and steep. Elevation ranges from 5,800 to 7,200 feet. Average annual precipitation is about 14 inches, average annual air temperature is about 47 degrees F, and the average frost-free season is about 115 days.

The Midway soil makes up about 40 percent of this complex and is on the upper part of slopes and on ridgetops. The Gaynor soil makes up about 40 percent and is in a lower position on the slopes than the Midway soil and in less sloping areas.

Included with these soils in mapping are a few small areas of Colona, Razor, and Killpack soils and small areas of shale rocklands. Included areas make up 20 percent of the map unit. In some places the surface layer is gravelly or cobbly. Because of the variable nature of the shale, in some places the soil is darker colored in the surface layer and throughout the profile.

The Midway soil is shallow and well drained and overlies shale bedrock at a depth of 10 to 20 inches. It formed in weathered, silty, calcareous shale.

Typically the surface layer of the Midway soil is light yellowish brown silty clay loam about 3 inches thick. The upper part of the underlying material is light yellowish brown silty clay about 8 inches thick, and the lower part is pale yellow silty clay. Shale bedrock is at a depth of about 16 inches.

In the Midway soil, permeability is slow and available water capacity is low. Effective rooting depth is about 16 inches. Surface runoff is rapid. The hazard of erosion from wind is slight and from water is high.

On the Midway soil the native vegetation consists mainly of big sagebrush, fourwing saltbush, and scattered pinyon and juniper. Western wheatgrass, Indian ricegrass, and squirreltail are the principal grasses in the understory.

The Gaynor soil is moderately deep and well drained and overlies shale bedrock at a depth of 20 to 40 inches. It formed in silty calcareous shale and is on side slopes and ridgetops in uplands.

Typically the surface layer of the Gaynor soil is light brownish gray silty clay loam about 4 inches thick. The underlying material is pale yellow silty clay. Shale bedrock is at a depth of about 30 inches.

In the Gaynor soil, permeability is slow and available water capacity is moderate. Effective rooting depth is about 30 inches. Surface runoff is rapid. The hazard of erosion from wind is slight and from water is high.

On the Gaynor soil the native vegetation consists mainly of big sagebrush, fourwing saltbush, and scattered pinyon and juniper. Western wheatgrass, Indian ricegrass, and squirreltail are the principal grasses in the understory.

Most of the acreage of this complex is in native vegetation and is used for grazing by livestock and wildlife and for recreational purposes.

Because of slope, soil depth, and low available water capacity, these soils are unsuited to crops. Grasses can be planted in areas where the slope permits seedbed preparation and drilling of seed, but only fair results can be expected. Western wheatgrass, Indian ricegrass, Siberian wheatgrass, and crested wheatgrass can be planted to protect the soils from erosion and to provide very limited grazing for livestock. Good pasture management is needed to maintain the grasses.

These soils are well suited to Utah juniper and pinyon pine. They can produce 7 cords per acre in a stand in which tree trunks have an average diameter of 5 inches at a height of one foot. The main soil limitation is the hazard of erosion. Special attention is needed to minimize erosion during harvesting operations, and the use of equipment may be restricted when the soils are wet. The low available water capacity can inhibit seedling survival.

Areas of this complex provide habitat for mule deer and cottontail. Juniper trees offer an escape cover that is an essential habitat requirement of mule deer and should be considered in management. Grazing should be controlled to prevent depletion of the understory.

If these soils are used for urban development, the main limitations are slope, corrosivity, depth to bedrock, and shrink-swell potential. If they are used for septic tank absorption fields, permeability is also a limitation. The limitations can be overcome by the use of proper design and construction methods.

These soils are in capability subclass VIIe, nonirrigated.

57—Northwater loam, 5 to 25 percent slopes. This is a deep, well drained soil. It formed in cobbly alluvium and glacial drift and is on mountain side slopes, terraces, and outwash fans. Elevation ranges from 8,000 to 9,800 feet. Average annual precipitation is about 22 inches, average annual air temperature is about 39 degrees F, and the average frost-free season is about 70 days.

Typically the surface layer is dark brown or brown loam about 25 inches thick. The subsoil is yellowish brown heavy very cobbly clay loam about 19 inches thick. The substratum, to a depth of 60 inches, is pale brown very cobbly loam.

Permeability is moderate, and available water capacity is moderate. The effective rooting depth is 60 inches or

more. Surface runoff is medium. The hazard of erosion from wind is slight and from water is moderate.

Included with this soil in mapping are a few small areas of Rock outcrop and soils that have a cobbly surface layer. Also included are some areas of Haplaquolls, flooded. In some areas the subsoil is more clayey. In some small areas the subsoil has a lower content of cobbles and stones.

The native vegetation on this soil consists mainly of aspen mixed with Douglas-fir and Englemann spruce. Common grasses include Thurber fescue, Arizona fescue, and green needlegrass.

Most areas of this soil are in noncommercial forest and are used for limited grazing of livestock and wildlife and for recreation.

Because of a short growing season and because annual precipitation is low and has poor seasonal distribution, this soil is not suited to nonirrigated crops. Where native grasses have been depleted or destroyed, however, a high degree of success can be expected from pasture plantings of nonirrigated grasses in spring, late in summer, and in fall to protect the soil from erosion and to provide grazing for livestock. Good pasture management must be practiced to maintain the grasses. Smooth brome, orchardgrass, Kentucky bluegrass, and intermediate wheatgrass are adapted species.

The potential plant community in the understory consists mainly of fescues, bromes, needlegrasses, and wheatgrasses. As range condition deteriorates, these grasses decrease, forbs and woody shrubs increase, and undesirable weeds and annual plants invade and become more abundant.

Seeding is advisable in areas that have been denuded by fire. Western wheatgrass, slender wheatgrass, and Arizona fescue are suitable for seeding. Grasses that meet the seasonal requirements of livestock should be selected. Preparing a seedbed and drilling the seed help to obtain the best results. Seeded areas should be fenced.

This soil is suited to quaking aspen. It can produce 3,250 cubic feet, or 3,400 board feet, per acre of timber in a fully stocked stand of even-aged trees that are 80 years old. Moderate available water capacity, which can inhibit seedling survival, is the main limitation to the use of this soil for trees.

This soil provides habitat for band-tailed pigeon, blue grouse, mule deer, elk, and black bear. Proper grazing use by livestock maintains the quality of habitat for wildlife. Grasses and forbs that grow on this soil provide summer range for mule deer and elk.

If this soil is used for urban development, the main limitations are stoniness and slope. If it is used for septic tank absorption fields, permeability is the main limitation. The limitations can be overcome by the use of proper design and construction methods.

This soil is in capability subclass VIe, nonirrigated.

58—Northwater cobbly loam, 25 to 65 percent slopes. This is a deep, well drained soil. It formed in cobbly alluvium and glacial drift and is on mountain side slopes and outwash fans. Elevation ranges from 8,000 to 9,800 feet. Average annual precipitation is about 22 inches, average annual air temperature is about 39 degrees F, and the average frost-free season is about 70 days.

Typically the surface layer is dark brown cobbly loam about 11 inches thick and brown cobbly clay loam or very cobbly clay loam about 14 inches thick. The subsoil is yellowish brown very cobbly clay loam about 25 inches thick. The substratum, to a depth of 60 inches, is pale brown very cobbly loam.

Permeability is moderate, and available water capacity is moderate. Effective rooting depth is 60 inches or more. Surface runoff is medium to very rapid. The hazard of erosion from wind is slight and from water is moderate to high.

Included with this soil in mapping are a few small areas of soils that have slopes of less than 25 percent or more than 65 percent. In some areas the soils do not have a dark colored surface layer. In some areas the soil is free of cobbles and stones. Outcrops of rhyolite and volcanic rock are more common than on other Northwater soils. Piles of very large boulders and stones are in some areas.

The native vegetation on this soil consists mainly of aspen trees, bromes, needlegrasses, and wheatgrasses.

Most areas of this soil are in noncommercial forest, and are used for limited grazing of livestock and wildlife and for recreational purposes.

The potential plant community in the understory consists mainly of fescues, bromes, needlegrasses, and wheatgrasses. As range condition deteriorates, these grasses decrease, forbs and woody shrubs increase, and undesirable weeds and annual plants invade and become more abundant.

Seeding is advisable in areas that have been denuded by fire. Western wheatgrass, slender wheatgrass, and Arizona fescue are suitable for seeding. Grasses that meet the seasonal requirements of livestock should be selected. Seed must be broadcast because of the steep slopes. Seeded areas should be fenced.

This soil is suited to quaking aspen. It can produce 3,250 cubic feet, or 3,400 board feet, of timber per acre in a fully stocked, even-aged stand of trees that are 80 years old. Moderate available water capacity, which can inhibit seedling survival; slope; and erosion hazard are the main limitations to the use of this soil for trees. Special attention must be given to minimize soil erosion during harvesting operations.

This soil provides habitat for band-tailed pigeon, blue grouse, mule deer, elk, and black bear. Proper grazing use by livestock maintains the good quality of habitat for wildlife. Grasses and forbs provide summer range for mule deer and elk.

If this soil is used for urban development, the main limitations are slope and stoniness. If it is used for septic tank absorption fields, permeability is the main limitation. The limitations can be overcome by the use of proper design and construction methods.

This soil is in capability subclass VIIe, nonirrigated.

59—Persayo silty clay loam, 12 to 35 percent slopes. This is a shallow, well drained soil that overlies Mancos shale at a depth of 10 to 20 inches. It formed in material weathered from shale and is on uplands. Elevation ranges from 4,800 to 6,000 feet. Average annual precipitation is about 9 inches, average air temperature is about 51 degrees F, and the average frost-free season is about 145 days.

Typically the surface layer is light yellowish brown silty clay loam about 4 inches thick. The underlying material is light brownish gray silty clay loam. Mancos shale is at a depth of about 15 inches.

Permeability is moderately slow, and available water capacity is low. Effective rooting depth is about 10 to 20 inches. Surface runoff is rapid. The hazard of erosion from wind is moderate and from water is high.

Included with this soil in mapping are a few small areas of Chipeta and Killpack soils. Also included are soils that have a stony or cobbly surface layer and areas where shale crops out. In places the surface layer is silt loam or silty clay.

The native vegetation on this soil consists mainly of mat saltbush, Gardner saltbush, fourwing saltbush, shadscale, and adapted grasses.

All areas of this soil are used for grazing of livestock and wildlife and for recreational purposes.

Because of steepness of slope, shallow soil depth, and low available water capacity, this soil is unsuited to crops. Grasses can be planted where the slope permits seedbed preparation and drilling of seed, but only fair results can be expected. If established, Russian wildrye, tall wheatgrass, pubescent wheatgrass, Siberian wheatgrass, and crested wheatgrass help to protect the soil from erosion and to provide very limited grazing for livestock.

The potential plant community on this soil consists mainly of galleta, shadscale, and Gardner saltbush. As range condition deteriorates, galleta decreases, forbs and woody shrubs increase, and undesirable weeds and annual plants invade and become more abundant.

Seeding has a limited chance of success where slope permits seedbed preparation and drilling operation, but seeding may be advisable if range is in poor condition. Best results can be expected from galleta, Indian ricegrass, sand dropseed, and needleandthread. Irrigation may be required in newly seeded areas until the plants are established. Preparing a seedbed and drilling the seed help to obtain the best results. Grasses that meet the seasonal requirements of livestock should be selected. Seeded areas should be fenced.

This soil provides habitat for pronghorn antelope, desert cottontail, and mourning dove. Where water is available, water developments and food plots can be used to improve wildlife habitat.

Where these soils are used for irrigated crops, a conservation cropping system that includes grain crops improves habitat for ring-necked pheasant. A food supply and nesting cover are important habitat elements required by pheasant.

If this soil is used for urban development, the main limitations are depth to bedrock, slope, and shrink-swell potential. The limitations can be overcome by the use of proper design and construction methods.

This soil is in capability subclass VIIe, nonirrigated.

60—Potts loam, 1 to 6 percent slopes. This is a deep, well drained soil. It formed in alluvial sediment derived from sandstone and is on valley-filling slopes and alluvial fans. Elevation ranges from 5,800 to 7,000 feet. Average annual precipitation is about 12 inches, average annual air temperature is about 46 degrees F, and the average frost-free season is about 115 days.

Typically the surface layer is light brown loam about 6 inches thick. The subsoil is reddish brown clay loam about 10 inches thick. The substratum, to a depth of 60 inches, is light reddish brown loam.

Permeability is moderate, and available water capacity is high. Effective rooting depth is 60 inches or more. Surface runoff is medium. The hazard of erosion from wind is slight and from water is moderate.

Included with this soil in mapping are a few small areas of Kech, Progresso, and Work soils.

The native vegetation on this soil consists mainly of pinyon, juniper, big sagebrush, Indian ricegrass, Junegrass, bluebunch wheatgrass, and galleta.

Some areas of this soil are in native vegetation and are used for grazing of livestock and wildlife and for recreational purposes. Some areas are used for irrigated crops, mainly hay, small grains, pasture, and corn for silage.

This soil is suited to all of the crops commonly grown in the survey area, except those which require a very long growing season. Care is needed to prevent water erosion. The soil can be kept in continuous row crops if crop residue is used to maintain an adequate content of organic matter and if good management of irrigation water and land leveling are used to control erosion. Minimum tillage and the use of cover crops and green manure crops also help to maintain organic matter content and to control erosion.

This soil can be used for irrigated pasture and hay crops. It is well suited to smooth brome, orchardgrass, pubescent wheatgrass, alfalfa, and clover. Irrigation can be done by contour ditch, corrugation, and furrow methods.

Because annual precipitation is low and has poor seasonal distribution, this soil is not suited to nonirrigated crops. However, nonirrigated pasture grasses can be

planted late in summer and in fall to protect the soil from erosion and to provide grazing for livestock, if good pasture management is practiced. Siberian wheatgrass, Fairway wheatgrass, crested wheatgrass, and pubescent wheatgrass are adapted species.

The potential plant community on this soil consists mainly of bluebunch wheatgrass, Junegrass, western wheatgrass, Indian ricegrass, galleta, needleandthread, and squirreltail. As range condition deteriorates, wheatgrasses, Indian ricegrass, Junegrass, and needleandthread decrease, forbs and woody shrubs increase, and undesirable weeds and annual plants invade and become more abundant.

Seeding is advisable if range is in poor condition. Western wheatgrass, bluebunch wheatgrass, Indian ricegrass, and needleandthread are suitable for seeding. Grasses that meet the seasonal requirements of livestock should be selected. Preparing a seedbed and drilling the seed help to obtain the best results. Seeded areas should be fenced.

This soil is used for winter range by mule deer. Big sagebrush, mountainmahogany, and bitterbrush are important browse species which can be managed for optimum production.

This soil is suited to most of the orchard crops grown in the survey area. The principal orchard crops grown on this soil are apples, pears, peaches, and cherries. Because of shortness of the growing season and frost which occurs early in spring, crops can be severely damaged. Areas that have good air drainage should be selected. Cover crops are necessary to control erosion but should be managed so that they do not compete with fruit trees. Application of fertilizer promotes the best growth of trees and the production of high quality fruit. Fertilizer requirements should be based on soil or foliage analysis. An intensive spray program is generally needed to control insects and disease. Estimated average yields per acre for orchard crops are as follows: apples, 750 bushels; peaches, 550 bushels; cherries, 800 bushels; and pears, 500 bushels.

If this soil is used for urban development, the main limitation is corrosivity. If it is used for septic tank absorption fields, permeability is the main limitation. The limitations can be overcome by the use of proper design and construction methods.

This soil is in capability subclasses IIIe, irrigated, and VIe, nonirrigated.

61—Progresso loam, 3 to 6 percent slopes. This is a moderately deep, well drained soil that overlies hard Dakota Sandstone at a depth of 20 to 40 inches. It formed in locally transported sediment derived from interbedded sandstone and shale and is on upland side slopes and fans. Elevation ranges from 5,800 to 7,000 feet. Average annual precipitation is about 12 inches, average annual air temperature is about 46 degrees F, and the average frost-free season is about 115 days.

Typically the surface layer is pinkish gray loam about 5 inches thick. The subsoil is brown or light brown clay loam about 17 inches thick. The substratum is white channery loam. Hard sandstone is at a depth of about 30 inches.

Permeability is moderate, and available water capacity is moderate. Effective rooting depth is about 20 to 40 inches. Surface runoff is medium. The hazard of erosion from wind and water is moderate.

Included with this soil in mapping are a few small areas of Kech, Potts, Shavano, and Lazear soils. Also included are areas of Progresso soils that have a channery surface layer and areas where sandstone bedrock crops out.

The native vegetation on this soil consists mainly of pinyon, juniper, big sagebrush, Indian ricegrass, needleandthread, Junegrass, native bunch bluegrass, and wheatgrasses.

Some areas of this soil are in native vegetation and are used for grazing by livestock and wildlife and for recreational purposes. Some areas are used for irrigated crops, mainly small grains, hay, pasture, and corn for silage.

This soil is suited to all of the crops commonly grown in the survey area, except those which require a long growing season. Extreme care is needed to prevent wind and water erosion. Maintaining the content of organic matter is important. Light and frequent application of irrigation water is necessary. This soil can be used for continuous row crops or can be planted to grasses and legumes about one-fourth of the time. Using green manure crops, return of crop residue to the soil, good management of irrigation water, including grasses and legumes in the cropping system, land leveling, and minimum tillage help to maintain organic matter content and to control erosion. Leveling operations and crop yields may be limited by moderately shallow soil depth. The shortness of the growing season may limit yields and the choice of crops.

This soil can be used for irrigated pasture or hay crops. It is well suited to alfalfa, smooth brome, orchardgrass, intermediate wheatgrass, and clover. Irrigation can be done by contour ditch, corrugation, and furrow methods.

Because annual precipitation is low and has poor seasonal distribution, this soil is not suited to nonirrigated crops. However, nonirrigated pasture grasses can be planted late in summer and in fall to protect the soil from erosion and to provide grazing for livestock, if good pasture management is practiced. Pubescent wheatgrass, Russian wildrye, and crested wheatgrass are adapted species.

The potential plant community on this soil consists mainly of bluebunch wheatgrass, Junegrass, western wheatgrass, Indian ricegrass, galleta, needleandthread, and squirreltail. As range condition deteriorates, wheatgrasses, Indian ricegrass, Junegrass, and needleandth-

read decrease, forbs and woody shrubs increase, and undesirable weeds and annual plants invade and become more abundant.

Seeding is advisable if range is in poor condition. Western wheatgrass, bluebunch wheatgrass, Indian ricegrass, and needleandthread are suitable for seeding. Grasses that meet the seasonal requirements of livestock should be selected. Preparing a seedbed and drilling the seed help to obtain the best results. Seeded areas should be fenced.

This soil is used for winter range by mule deer. Big sagebrush, mountainmahogany, and bitterbrush are important browse species which can be managed for optimum production.

If this soil is used for urban development, the main limitations are depth to rock and corrosivity. If it is used for septic tank absorption fields, permeability is also a limitation. The limitations can be overcome by the use of proper design and construction methods.

This soil is in capability subclasses IVe, irrigated, and VIe, nonirrigated.

62—Progresso loam, 6 to 12 percent slopes. This is a moderately deep, well drained soil that overlies hard Dakota Sandstone at a depth of 20 to 40 inches. It formed in locally transported sediment derived from interbedded sandstone and shale and is on uplands and fans. Elevation ranges from 5,800 to 7,000 feet. Average annual precipitation is about 12 inches, average annual air temperature is about 46 degrees F, and the average frost-free season is about 115 days.

Typically the surface layer is pinkish gray loam about 5 inches thick. The subsoil is brown or light brown clay loam about 17 inches thick. The substratum is white channery loam. Hard sandstone is at a depth of about 30 inches.

Permeability is moderate, and available water capacity is moderate. Effective rooting depth is about 20 to 40 inches. Surface runoff is medium to rapid. The hazard of erosion from wind is moderate and from water is high.

Included with this soil in mapping are a few small areas of Kech, Potts, Lazear, and Shavano soils. Also included are areas of Progresso soils that have a channery surface layer and areas where sandstone bedrock crops out.

The native vegetation on this soil consists mainly of pinyon, juniper, big sagebrush, Indian ricegrass, needleandthread, Junegrass, native bunch bluegrass, and wheatgrass.

Some areas of this soil are in native vegetation and are used for grazing of livestock and wildlife and for recreational purposes. Some areas are used for irrigated crops, mainly hay, small grains, and irrigated pasture.

This soil is suited to all of the crops commonly grown in the survey area, except those which require a long growing season. Extreme care is needed to prevent wind and water erosion. Maintaining the content of organic matter is important. Light and frequent application of irrigation water is necessary. This soil can be used for continuous row crops or can be planted to grasses and legumes about one-fourth of the time. Use of green manure crops, use of crop residue, good management of irrigation water including grasses and legumes in the cropping system, land leveling, and minimum tillage help to maintain organic matter content and to control erosion. Leveling operations and crop yields may be limited by moderately shallow soil depth. Shortness of the growing season may also limit yields.

This soil can be used for irrigated pasture and hay crops. It is well suited to alfalfa, smooth brome, orchardgrass, intermediate wheatgrass, and clover. Irrigation can be done by contour ditch and corrugation methods.

Because annual precipitation is low and has poor seasonal distribution, this soil is not suited to nonirrigated crops. However, nonirrigated pasture grasses can be planted late in summer and in fall to protect the soil from erosion and to provide grazing for livestock, if proper pasture management is practiced. Pubescent wheatgrass, Russian wildrye, and crested wheatgrass are adapted species.

The potential plant community on this soil consists mainly of bluebunch wheatgrass, Junegrass, western wheatgrass, Indian ricegrass, galleta, needleandthread, and squirreltail. As range condition deteriorates, wheatgrasses, Indian ricegrass, Junegrass, and needleandthread decrease, forbs and woody shrubs increase, and undesirable weeds and annual plants invade and become more abundant.

Seeding is advisable if range is in poor condition. Western wheatgrass, bluebunch wheatgrass, Indian ricegrass, and needleandthread are suitable for seeding. Grasses that meet the seasonal requirements of livestock should be selected. Preparing a seedbed and drilling the seed help to obtain the best results. Seeded areas should be fenced.

This soil is used for winter range by mule deer. Big sagebrush, mountainmahogany, and bitterbrush are important browse species which can be managed for optimum production.

If this soil is used for urban development, the main limitations are depth to bedrock and corrosivity. If it is used for septic tank absorption fields, permeability is also a limitation. The limitations can be overcome by the use of proper design and construction methods.

This soil is in capability subclasses IVe, irrigated, and VIe, nonirrigated.

63—Progresso-Potts association, 1 to 6 percent slopes. These gently sloping to strongly sloping soils are on uplands and fans. Elevation ranges from 5,500 to 7,000 feet. Average annual precipitation is about 12 inches, average annual air temperature is about 46 degrees F, and the average frost-free season is about 115 days.

The Progresso soil makes up about 40 percent of this association and is in positions higher on the slope than

the Potts soil and also on small ridgetops. The Potts soil makes up about 40 percent and is in positions downslope from the Progresso soil and also in small depressions.

Included with these soils in mapping are a few small areas of Kech, Lazear, Shavano, Beenom, Absarokee, and Work soils. These soils make up 20 percent of the map unit.

The Progresso soil is moderately deep and well drained and overlies bedrock at a depth of 20 to 40 inches. It formed in place and also in locally transported sediment that was derived from sandstone and interbedded shale.

Typically the surface layer of the Progresso soil is pinkish gray loam about 5 inches thick. The subsoil is brown or light brown clay loam about 17 inches thick. The substratum is white channery loam. Sandstone bedrock is at a depth of about 30 inches.

In the Progresso soil, permeability is moderate and available water capacity is moderate. Effective rooting depth is about 30 inches. Surface runoff is medium. The hazard of erosion from wind and water is moderate.

On the Progresso soil the native vegetation consists mainly of big sagebrush and scattered pinyon and juniper. Wheatgrass, Junegrass, Indian ricegrass, and squirreltail are common grasses.

The Progresso soil is suited to all of the crops commonly grown in the survey area, except those which require a long growing season. Extreme care is needed to prevent wind and water erosion. Maintaining the content of organic matter is important. Light but frequent application of irrigation water is necessary. This soil can be used for continuous row crops or can be planted to grasses and legumes about one-fourth of the time. Use of green manure crops, return of crop residue to the soil, good management of irrigation water, including grasses and legumes in the cropping system, land leveling, and minimum tillage help to maintain organic matter content and control erosion. Land leveling operations and crop yields may be limited by the moderately shallow soil depth. The short growing season may also limit yields and the choice of crops.

The Progresso soil can be used for irrigated pasture and hay crops. It is well suited to alfalfa, smooth brome, orchardgrass, intermediate wheatgrass, and clover. Irrigation can be done by contour ditch, corrugation, and furrow methods.

Because annual precipitation is low and has poor seasonal distribution, the Progresso soil is not suited to nonirrigated crops. However, nonirrigated pasture grasses can be planted late in summer and in fall to protect the soil from erosion and to provide grazing for livestock, if good pasture management is used. Pubescent wheatgrass, Russian wildrye, and crested wheatgrass are adapted species.

The potential plant community on the Progresso soil consists mainly of bluebunch wheatgrass, Junegrass, and needleandthread grass. As the range condition deteriorates, forbs and woody shrubs increase, and undesirable weeds and annual plants invade and become more abundant.

Seeding of the Progresso soil is advisable if range is in poor condition. Western wheatgrass, bluebunch wheatgrass, Indian ricegrass, and needleandthread are suitable for seeding. Grasses that meet the seasonal requirements of livestock should be selected. Preparing a seedbed and drilling seed help to obtain the best results. Seeded areas should be fenced.

The Progresso soil is used for winter range by mule deer. Big sagebrush, mountainmahogany, and bitterbrush are important browse species which can be managed for optimum production.

The Progresso soil is suited to most of the crops grown in the survey area. The principal orchard crops grown on this soil are apples, pears, peaches, and cherries. Areas of shallow soil should not be used for trees. The growing season is short, and spring frost can seriously damage fruit crops. Areas with good air drainage should be selected for planting. Cover crops are needed to control erosion but should be managed so that they do not compete with trees. Application of fertilizer promotes the best growth of trees and the production of high quality fruit. Fertilizer requirements should be based on an analysis of the soil. An intensive spray program is generally needed to control insects and disease. Estimated average yields per acre for orchard crops are as follows: apples, 700 bushels; peaches, 500 bushels; cherries, 700 bushels; and pears, 500 bushels.

If the Progresso soil is used for urban development, the main limitations are depth to bedrock and corrosivity. If it is used for septic tank absorption fields, permeability is a limitation. The limitations can be overcome if proper design and construction methods are used.

The Potts soil is deep to very deep. It formed in locally transported alluvium derived from sandstone and interbedded shale.

Typically the surface layer of the Potts soil is light brown loam about 6 inches thick. The subsoil is reddish brown clay loam about 10 inches thick. The substratum, to a depth of 60 inches, is light reddish brown loam.

In the Potts soil, permeability is moderate and available water capacity is high. Effective rooting depth is 60 inches or more. Surface runoff is medium. The hazard of erosion from wind is slight and from water is moderate.

On the Potts soil the native vegetation consists mainly of big sagebrush and scattered pinyon and juniper. Wheatgrasses, Junegrass, Indian ricegrass, and squirreltail are common grasses.

Where irrigation water is available, the main crops grown on the Potts soil are alfalfa, small grains, corn for silage, and hay and pasture. Orchard crops are also grown.

The Potts soil is suited to all crops except those which require a very long growing season. Care is needed to

prevent water erosion. This soil can be kept in continuous row crops if crop residue is used to maintain the content of organic matter, and if good management of irrigation water and land leveling are used to control erosion. Minimum tillage and the use of cover crops and green manure crops also help to maintain organic matter content and control erosion.

The Potts soil can be used for irrigated pasture and hay crops. It is well suited to smooth brome, orchardgrass, intermediate wheatgrass, alfalfa, and clover. Irrigation can be done by contour ditch, corrugation, and furrow methods.

Because annual precipitation is low and has poor seasonal distribution, the Potts soil is not suited to nonirrigated crops. However, nonirrigated pasture grasses can be planted late in summer and in fall to protect the soil from erosion and to provide grazing for livestock, if good pasture management is practiced. Pubescent wheatgrass, Russian wildrye, and crested wheatgrass are adapted species.

The potential plant community on the Potts soil consists mainly of bluebunch wheatgrass, Junegrass, western wheatgrass, Indian ricegrass, galleta, needleandthread, and squirreltail. As range condition deteriorates, the wheatgrasses, Indian ricegrass, Junegrass, and needleandthread decrease, forbs and woody shrubs increase, and undesirable weeds and annual plants invade and become more abundant.

Seeding of the Potts soil is advisable if range is in poor condition. Western wheatgrass, bluebunch wheatgrass, Indian ricegrass, and needleandthread are suitable for seeding. Grasses that meet the seasonal requirements of livestock should be selected. Preparing a seedbed and drilling the seed help to obtain the best results. Seeded areas should be fenced.

The Potts soil is used for winter range by mule deer. Big sagebrush, mountainmahogany, and bitterbrush are important browse species which can be managed for optimum production.

The Potts soil is suited to most of the orchard crops grown in the survey area. The principal orchard crops grown on this soil are apples, pears, peaches, and cherries. Areas of shallow soil should not be selected for planting of trees. The growing season is short and frost in spring can seriously damage fruit crops. Areas with good air drainage should be selected. Cover crops are needed to control erosion but should be managed so that they do not compete with trees. Application of fertilizer promotes the best growth of trees and the production of high quality fruit. Fertilizer requirements should be based on soil or foliage analysis. An intensive spray program is generally needed to control insects and disease. Estimated average yields per acre for orchard crops are as follows: apples, 700 bushels; peaches, 500 bushels; cherries, 700 bushels; and pears, 500 bushels.

If the Potts soil is used for urban development, the main limitation is corrosivity. If this soil is used for septic tank absorption fields, permeability is the main limitation. The limitations can be overcome if proper design and construction methods are used.

The Progresso part of this association is in capability subclasses IVe, irrigated, and VIe, nonirrigated; Potts part is in capability subclasses IIIe, irrigated, and VIe, nonirrigated.

64—Radersburg loam, 6 to 12 percent slopes. This is a deep, well drained soil. It formed in cobbly alluvium and is on old, high terraces and mountain side slopes. Elevation ranges from 6,200 to 8,000 feet. Average annual precipitation is about 16 inches, average annual air temperature is about 43 degrees F, and the average frost-free season is about 100 days.

Typically the surface layer is grayish brown loam about 5 inches thick. The subsoil is brown very gravelly heavy clay loam about 16 inches thick. The substratum, to a depth of 60 inches, is white very gravelly loam.

Permeability is moderately slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Surface runoff is medium to rapid. The hazard of erosion from wind is slight and from water is moderate to high.

Included with this soil in mapping are a few small areas of Cerro, Saraton, and Work soils. Also included are soils that have a gravelly or cobbly surface layer. Also, the surface layer is sandy loam or clay loam in places.

The native vegetation on this soil consists mainly of snowberry, serviceberry, big sagebrush, and widely scattered pinyon. Adapted grasses include wheatgrass, Idaho fescue, native bluegrass, and needlegrasses.

Most areas of this soil are used for grazing of livestock and wildlife and for recreational purposes. Some areas are irrigated, and the main crops grown are hay, small grains, and pasture.

This soil is suited to all of the crops commonly grown in the survey area, except those which require a long growing season. Care is necessary to control water and wind erosion. Maintaining the content of organic matter is important. This soil should be kept in grasses, legumes, or close-growing crops at least one-fourth of the time, and row crops in rotation should be grown no more than 3 years consecutively. Use of crop residue, land leveling, good management of irrigation water, and using cover crops and green manure crops help to maintain organic matter content and to control erosion. Shortness of the growing season may limit the choice of crops.

This soil can be used for irrigated pasture and hay crops. It is well suited to alfalfa, smooth brome, orchardgrass, intermediate wheatgrass, and clover. Irrigation can be done by contour ditch, corrugation, and furrow methods.

Because annual precipitation is low and has poor seasonal distribution, this soil is not suited to nonirrigated crops. However, nonirrigated pasture grasses can be planted late in summer and in fall to protect the soil from

erosion and to provide grazing for livestock, if good pasture management is practiced. Pubescent wheatgrass, hard fescue, and crested wheatgrass are adapted species.

The potential plant community on this soil consists mainly of western wheatgrass, slender wheatgrass, bluegrasses, and Arizona fescue. As range condition deteriorates, western wheatgrass, slender wheatgrass, bluegrasses, and Arizona fescue decrease, forbs and woody shrubs increase, and undesirable weeds and annual plants invade and become more abundant.

Seeding is advisable if range is in poor condition. Western wheatgrass, bluegrasses, slender wheatgrass, and Arizona fescue are suitable for seeding. Grasses that meet the seasonal requirements of livestock should be selected. Preparing a seedbed and drilling the seed help to obtain the best results. On some sites, control of competing shrubs is required to improve range condition. Seeded areas should be fenced.

This soil is used for winter range by mule deer and elk. Some important plant species which can be managed for optimum production are big sagebrush, bitterbrush, serviceberrry, low rabbitbrush, and wild rose.

If this soil is used for urban development, the main limitations are shrink-swell potential and small stones. If it is used for septic tank absorption fields, permeability is the main limitation. The limitations can be overcome by the use of proper design and construction methods.

This soil is in capability subclasses IVe, irrigated, and VIe. nonirrigated.

65—Radersburg cobbly loam, 10 to 35 percent slopes. This is a deep, well drained soil. It formed in cobbly alluvium and is on old, high terraces and mountain side slopes. Elevation ranges from 6,200 to 8,000 feet. Average annual precipitation is about 16 inches, average annual air temperature is about 43 degrees F, and the average frost-free season is about 100 days.

Typically the surface layer is grayish brown cobbly loam about 5 inches thick. The subsoil is brown very gravelly heavy clay loam about 16 inches thick. The substratum, to a depth of 60 inches, is white very gravelly loam.

Permeability is moderately slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Surface runoff is rapid. The hazard of erosion from wind is slight and from water is high.

Included with this soil in mapping are a few small areas of Cerro, Scholle, and Work soils. In some areas the soil is free of cobbles or the surface layer is sandy loam or light clay loam.

The native vegetation on this soil consists mainly of snowberry, serviceberry, big sagebrush, and widely scattered pinyon and juniper. Adapted grasses include wheatgrasses, Idaho fescue, native bluegrass, needlegrasses, and Junegrass.

Most areas of this soil are used for grazing of livestock and wildlife and for recreational purposes. Some areas are in noncommercial forest and are used for limited grazing of livestock and wildlife and for recreational purposes.

Because annual precipitation is low and has poor seasonal distribution, this soil is not suited to nonirrigated crops. Where native grasses have been depleted or destroyed, a high degree of success can be expected from pasture plantings of nonirrigated grasses in spring, late in summer, and in fall to protect the soil from erosion and to provide grazing for livestock. Good pasture management must be practiced to maintain grasses. Pubescent wheatgrass, hard fescue, and crested wheatgrass are adapted species.

The potential plant community on this soil consists mainly of western wheatgrass, slender wheatgrass, bluegrasses, and Arizona fescue. As range condition deteriorates, western wheatgrass, slender wheatgrass, bluegrasses, and Arizona fescue decrease, forbs and woody shrubs increase, and undesirable weeds and annual plants invade and become more abundant.

Seeding is advisable where slope permits, if range is in poor condition. Western wheatgrass, bluegrasses, slender wheatgrass, and Arizona fescue are suitable for seeding. Grasses that meet the seasonal requirements of livestock should be selected. Preparing a seedbed and drilling the seed help to obtain the best results. On some sites, control of competing shrubs is required to improve range condition. Seeded areas should be fenced.

This soil is used for winter range by mule deer and elk. Some important plant species which can be managed for optimum production are big sagebrush, bitterbrush, serviceberry, low rabbitbrush, and wild rose.

If this soil is used for urban development, the main limitations are slope, shrink-swell potential and large stones. If it is used for septic tank absorption fields, permeability is the main limitation. The limitations can be overcome by the use of proper design and construction methods.

This soil is in capability subclass VIe, nonirrigated.

66—Razor silty clay loam, 3 to 12 percent slopes. This is a moderately deep, well drained soil that overlies shale at a depth of 20 to 40 inches. It formed in locally transported alluvium derived from shale and is on upland side slopes and fans. Elevation ranges from 6,000 to 7,000 feet. Average annual precipitation is about 14 inches, average annual air temperature is about 46 degrees F, and the average frost-free season is about 115 days.

Typically the surface layer is pale brown silty clay loam about 3 inches thick. The subsoil is light olive brown silty clay loam about 12 inches thick. The substratum is light olive brown silty clay loam. Soft, silty, calcareous shale is at a depth of about 26 inches.

Permeability is slow, and available water capacity is moderate. Effective rooting depth is about 26 inches.

Surface runoff is medium to rapid. The hazard of erosion from wind is slight and from water is high.

Included with this soil in mapping are a few small areas of Colona, Midway, Gaynor, and Apishapa soils. In some places the surface layer is silt loam or silty clay loam. The surface layer commonly is cobbly.

The native vegetation on this soil consists mainly of big sagebrush, fourwing saltbush, winterfat, and western wheatgrass.

About half the acreage of this soil is used for grazing of livestock and wildlife and for recreational purposes. Some areas are irrigated and are used mainly for hay, small grains, corn for silage, pasture, and orchard crops.

This soil is suited to all of the crops commonly grown in the survey area, except those which require a long growing season. Extreme care is needed to prevent water erosion. Maintaining the content of organic matter is important. The soil should be kept in grasses or legumes at least one-fourth of the time, and row crops in rotation should be grown no more than 3 years consecutively. Use of crop residue, land leveling, good management of irrigation water, and using cover crops and green manure crops help to maintain organic matter content and control erosion.

This soil can be used for irrigated pasture and hay crops. It is well suited to alfalfa, smooth brome, orchardgrass, intermediate wheatgrass, and clover. Irrigation can be done by contour ditch, corrugation, and furrow methods.

Because annual precipitation is low and has poor seasonal distribution, this soil is not suited to nonirrigated crops. However, nonirrigated pasture grasses can be planted late in summer and in fall to protect the soil from erosion and to provide grazing for livestock, if good pasture management is practiced. Pubescent wheatgrass, Russian wildrye, and crested wheatgrass are adapted species.

The potential plant community in rangeland areas of this soil consists mainly of galleta, western wheatgrass, and beardless wheatgrass. The understory in woodland areas consists mainly of western wheatgrass, Indian ricegrass, squirreltail, and galleta. As range condition deteriorates, these grasses decrease, forbs and woody shrubs increase, and undesirable weeds and annual plants invade and become more abundant.

Seeding is advisable in rangeland areas if the site is in poor condition. Western wheatgrass and Indian ricegrass are suitable for seeding. To a limited extent, seeding is also advisable in woodland areas, and the same grasses are suitable for seeding. Grasses that meet the seasonal requirements of livestock should be selected. Preparing a seedbed and drilling the seed help to obtain the best results. Seeded areas should be fenced.

This soil is used for winter range by mule deer. Big sagebrush is grazed by mule deer in winter and can be managed for optimum production. Desert cottontail use areas of this soil as habitat, but their numbers are governed largely by climatic conditions.

If this soil is used for urban development, the main limitations are depth to bedrock and shrink-swell potential. If it is used for septic tank absorption fields, permeability is the main limitation. The limitations can be overcome by the use of proper design and construction methods.

This soil is in capability subclasses IVe, irrigated, and VIe, nonirrigated.

67—Rock outcrop. This miscellaneous area consists of bare exposures of bedrock on canyon walls, escarpments that surround mesas and benches, and very steep upland side slopes. It is more than 90 percent exposed bedrock that is mainly sandstone, interbedded sandstone and shale, and intrusive and extrusive igneous rock. Mapped areas are more than 3 acres in size. Rock outcrop is scattered throughout the survey area. Slopes range from 50 percent to nearly vertical.

Included with Rock outcrop in mapping are areas of shallow to deep, stony soils that have a sparse cover of vegetation.

Areas of Rock outcrop have little value for grazing but provide cover for wildlife and enhance the scenery. These areas are used mainly for wildlife habitat and recreational purposes. Urban development is difficult or impractical.

Rock outcrop is in capability subclass VIII, nonirrigated.

68—Saraton gravelly loam, 3 to 12 percent slopes. This is a moderately deep, well drained soil that overlies marl at a depth of 20 to 40 inches. It formed in cobbly or stony outwash alluvium and is on old terraces, mesas, and side slopes. Elevation ranges from 5,800 to 7,000 feet. Average annual precipitation is about 13 inches, average annual air temperature is about 48 degrees F, and the average frost-free season is about 115 days.

Typically the surface layer is brown gravelly loam about 5 inches thick. The underlying material is pinkish white very gravelly loam. Marl is at a depth of about 30 inches.

Permeability is moderate, and available water capacity is low. Effective rooting depth is about 28 inches. Surface runoff is medium. The hazard of erosion from wind is slight and from water is moderate.

Included with this soil in mapping are a few small areas of Agua Fria, Avalon, Radersburg, Delson, and Cerro soils. In some areas the surface texture is sandy loam or is stony.

The native vegetation on this soil consists mainly of big sagebrush, pinyon, and juniper. Adapted grasses include wheatgrasses, buttongrass, Indian ricegrass, and squirreltail.

About half the acreage of this soil is in native vegetation and is used for grazing of livestock and wildlife and for recreational purposes. Some areas are irrigated and

are used mainly for hay, small grains, corn for silage, and pasture. Some areas are used for orchard crops.

This soil is suited to all of the crops commonly grown in the survey area, except those which require a long growing season. Extreme care is needed to prevent water erosion. Maintaining the content of organic matter is important. This soil should be kept in grasses or legumes at least one-fourth of the time, and row crops in rotation should be grown no more than 3 years consecutively. Use of crop residue, land leveling, good management of irrigation water, and using cover crops and green manure crops help to maintain organic matter content and to control erosion. Leveling operations and alfalfa yields may be limited by the moderately shallow soil depth. Shortness of the growing season may also limit yields and the choice of crops.

This soil can be used for irrigated pasture and hay crops. It is well suited to alfalfa, smooth brome, orchardgrass, intermediate wheatgrass, and clover. Irrigation can be done by contour ditch, corrugation, and furrow methods.

Because annual precipitation is low and has poor seasonal distribution, this soil is not suited to nonirrigated crops. However, nonirrigated pasture grasses can be planted late in summer and in fall to protect the soil from erosion and to provide grazing for livestock, if good pasture management is practiced. Pubescent wheatgrass, Russian wildrye, and crested wheatgrass are adapted species.

The potential plant community in the understory consists mainly of bluebunch wheatgrass, western wheatgrass, needleandthread, Indian ricegrass, muttongrass, squirreltail, and galleta. As range condition deteriorates, these grasses decrease, forbs and woody shrubs increase, and undesirable weeds and annual plants invade and become more abundant.

Seeding is advisable in areas that have been denuded by fire. Western wheatgrass, bluebunch wheatgrass, Indian ricegrass, and needleandthread are suitable for seeding. Grasses that meet the seasonal requirements of livestock should be selected. Preparing a seedbed and drilling the seed help to obtain the best results. Good pasture and range management is needed to maintain the grasses.

This soil is suited to Utah juniper and pinyon pine. It can produce 7 cords per acre in a stand in which the tree trunks have an average diameter of 5 inches at a height of one foot. Low available water-holding capacity, which can inhibit seedling survival, is the main limitation to the use of this soil for trees.

This soil is used for winter range by mule deer. Big sagebrush, mountainmahogany, and bitterbrush are important browse species which can be managed for optimum production. In woodland areas this soil has some potential for habitat for blue grouse and band-tailed pigeon.

This soil is suited to most of the orchard crops grown in the survey area. The principal orchard crops grown on this soil are apples, cherries, pears, and peaches. Tree growth and production may be limited because of moderately shallow soil depth. In some areas stoniness hinders the operation of farm machinery. In areas where air drainage is poor, fruit crops can be seriously damaged by frost. Cover crops are necessary to control erosion but should be managed so that they do not compete with trees. Application of fertilizer promotes the best growth of trees and production of fruit. Fertilizer should be based on soil or foliage analysis. An intensive spray program is generally needed to control insects and disease. Estimated average yield per acre for orchard crops are as follows: apples, 750 bushels; peaches, 600 bushels; cherries, 850 bushels; and pears, 600 bushels.

If this soil is used for urban development, the main limitation is depth to bedrock. If it is used for septic tank absorption fields, permeability is also a limitation. The limitations can be overcome by the use of proper design and construction methods.

This soil is in capability subclasses IVe, irrigated, and VIe, nonirrigated.

69—Saraton stony loam, 3 to 20 percent slopes. This is a moderately deep, well drained soil that overlies marl at a depth of 20 to 40 inches. It formed in cobbly and stony outwash alluvium and is on old terraces, mesas, and side slopes. Elevation ranges from 5,800 to 7,000 feet. Average annual precipitation is about 13 inches, average annual air temperature is about 47 degrees F, and the average frost-free season is about 115 days.

Typically the surface layer is brown stony loam about 5 inches thick. The underlying material is pinkish white very gravelly loam. Marl is at a depth of about 30 inches.

Permeability is moderate, and available water capacity is low. Effective rooting depth is about 28 inches. Surface runoff is medium to rapid. The hazard of erosion from wind is slight and from water is moderate.

Included with this soil in mapping are a few small areas of Agua Fria, Avalon, Radersburg, Delson, and Cerro soils. Areas of soils that have a surface layer of loam or sandy loam are also included. In some areas the soil is free of stones.

The native vegetation on this soil consists mainly of big sagebrush, pinyon, and juniper. Adapted grasses include wheatgrasses, buttongrass, Indian ricegrass, and squirreltail.

This soil is in noncommercial forest and is used for limited grazing of livestock and wildlife and for recreational purposes.

Seedbed preparation and drilling of seed for pasture plantings in burned or cleared areas generally are not practical because of the surface stoniness. A limited degree of success can be expected by broadcasting seed late in summer and early in fall. Pubescent wheatgrass, Russian wildrye, western wheatgrass, Indian rice-

grass, and crested wheatgrass are adapted species. Good pasture management must be practiced to protect the soil from erosion and to provide grazing for livestock.

This soil is suited to Utah juniper and pinyon pine. It can produce 7 cords per acre in a stand in which the tree trunks have an average diameter of 5 inches at a height of one foot. Surface stoniness and moderate hazard of erosion are the main limitations to woodland use and management. Surface stoniness can hinder equipment operations, and special attention must be given to minimize erosion during harvesting operations. Low available water capacity, which can inhibit seedling survival, is also a limitation.

This soil is used for winter range by mule deer. Key species for winter forage include big sagebrush, mountainmahogany, and bitterbrush. This soil has limited potential for habitat for blue grouse. Encouragement of pinyon and juniper on suitable sites in localized areas can lead to establishment of a browse-grass plant community beneficial to livestock and mule deer. Pinyon and juniper trees provide cover which is a vital habitat requirement of mule deer and should be considered in management.

This soil is suited to most of the orchard crops grown in the survey area. The principal orchard crops grown on this soil are apples, cherries, pears, and peaches. Tree growth and production may be limited because of the moderately shallow soil depth. Stoniness hinders the operation of farm machinery. In areas where air drainage is poor, fruit crops can be seriously damaged by frost in spring. Cover crops are necessary to control erosion but should be managed so that they do not compete with trees. Application of fertilizer promotes the best growth of trees and production of fruit. Fertilizer requirements should be based on soil or foliage analysis. An intensive spray program is generally needed to control insects and disease.

If this soil is used for urban development, the main limitations are slope, stoniness, and depth to bedrock. If it is used for septic tank absorption fields, permeability is also a limitation. The limitations can be overcome by the use of proper design and construction methods.

This soil is in capability subclass VIIs, nonirrigated.

70—Saraton-Agua Fria complex, 20 to 50 percent slopes. These moderately steep to very steep soils are on side slopes of mesas, benches, and terraces. Elevation ranges from 5,800 to 7,000 feet. Average annual precipitation is about 14 inches, average annual air temperature is about 47 degrees F, and the average frost-free season is about 115 days.

The Saraton soil makes up about 40 percent of this complex and is on the upper part of slopes and in steeper areas. The Agua Fria soil makes up about 40 percent and is in a position lower on the slope than the Saraton soil and in small valleys.

Included with these soils in mapping are a few small areas of Delson, Mesa, Midway, and Gaynor soils. Also included are a few small areas of Torriorthents-Rock outcrop, sandstone, complex; and Torriorthents-Rock outcrop, shale, complex. In some places the surface layer is relatively free of stones. Included areas make up 20 percent of the map unit. Slips or small landslides are common.

The Saraton soil is moderately deep and well drained and overlies cobbly and stony marl at a depth of 20 to 40 inches. It formed in stony and cobbly outwash alluvium derived from basalt.

Typically the surface layer of the Saraton soil is brown gravelly loam about 5 inches thick. The underlying material is pinkish white very gravelly loam. Marl is at a depth of about 30 inches.

In the Saraton soil, permeability is moderate and available water capacity is low. Effective rooting depth is about 28 inches. Surface runoff is rapid. The hazard of erosion from wind is slight and from water is moderate to high.

On the Saraton soil the native vegetation consists mainly of pinyon, juniper, big sagebrush, and scattered Gambel oak and serviceberry. Western wheatgrass, Indian ricegrass, needleandthread, and Junegrass are common grasses.

The Agua Fria soil is deep and well drained. It formed in cobbly and stony outwash alluvium derived from basalt.

Typically the surface layer of the Agua Fria soil is brown stony loam about 2 inches thick. The subsoil is reddish brown or light brown stony clay loam about 22 inches thick. The upper part of the substratum is pink cobbly loam about 10 inches thick, and the lower part, to a depth of 60 inches, is pink very cobbly loam.

In the Agua Fria soil, permeability is moderately slow and available water capacity is high. Effective rooting depth is 60 inches or more. Surface runoff is rapid. The hazard of erosion from wind is slight and from water is moderate to high.

On the Agua Fria soil the native vegetation consists mainly of pinyon, juniper, big sagebrush, Gambel oak, and serviceberry. Western wheatgrass, Indian ricegrass, needleandthread, and Junegrass are common grasses.

Most areas of this complex are in noncommercial woodland and are used for limited grazing by livestock and wildlife and for recreational purposes.

Because of surface stoniness and slope, these soils are unsuited to crops. Seedbed preparation and drilling of seed for pasture plantings on depleted native range or in cleared areas are generally not practical because of surface stoniness. A limited degree of success can be expected by broadcasting seed late in summer or early in fall. Pubescent wheatgrass, western wheatgrass, Russian wildrye, Indian ricegrass, and crested wheatgrass are adapted species. Good pasture management is needed to protect the soils from erosion and to provide grazing for livestock.

These soils are suited to Utah juniper and pinyon pine. They can produce 9 cords per acre in a stand in which tree trunks have a diameter of 5 inches at a height of one foot. The main limitations to the use of these soils for trees are surface stoniness and moderate hazard of erosion. Surface stones can hinder equipment operations. Special attention is needed to minimize erosion during harvesting operations.

These soils are used for winter range by mule deer. The key species for winter forage include big sagebrush, mountainmahogany, and bitterbrush. These soils have limited potential for habitat for blue grouse. Encouragement of pinyon and juniper on suitable sites can lead to establishment of a browse-grass plant community beneficial to livestock and mule deer. Pinyon and juniper trees provide cover that is a vital habitat requirement of mule deer and should be considered in management.

If these soils are used for urban development, the main limitations are shrink-swell potential, depth to bedrock, slope, and stoniness. If they are used for septic tank absorption fields, permeability is also a limitation. The limitations can be overcome by the use of proper design and construction methods.

This complex is in capability subclass VIIs, nonirrigated.

71—Scholle stony loam, 3 to 12 percent slopes. This is a deep, well drained soil. It formed in cobbly alluvium and is on old terraces, mesas, and benches. Elevation ranges from 5,800 to 7,000 feet. Average annual precipitation is about 13 inches, average annual air temperature is about 46 degrees F, and the average frost-free season is about 115 days.

Typically the surface layer is pinkish gray stony loam about 4 inches thick. The subsoil is brown or light brown gravelly clay loam about 16 inches thick. The substratum, to a depth of 60 inches, is very pale brown cobbly loam.

Permeability is moderate, and available water capacity is moderate. Effective rooting depth is 60 inches or more. Surface runoff is moderate. The hazard of erosion from wind is slight and from water is moderate.

Included with this soil in mapping are a few small areas of Agua Fria, Saraton, Radersburg, and Cerro soils. Also included are small areas of soils that have a surface layer of loam, clay loam, or sandy loam.

About half the acreage of this soil is used for grazing of livestock and wildlife, and for recreational purposes. Some areas are in noncommercial forest. A small acreage is irrigated and is used for cultivated crops, pasture, hay, and orchard crops.

This soil is suited to all of the crops commonly grown in the survey area, except those which require a long growing season. However, clearing or rock picking may be required so that the soil can be tilled. Moisture intake rate of the surface layer is moderate and moderately slow, and the soil is easy to work after stones and cobbles have been removed. The soil can be kept in continuous row crops if crop residue is used to maintain an adequate content of organic matter. Good management of irrigation water and land leveling help to conserve irrigation water and to control erosion. Minimum tillage and using cover crops and green manure crops help to maintain organic matter content and to control erosion.

This soil can be used for irrigated pasture and hay crops. It is well suited to smooth brome, orchardgrass, intermediate wheatgrass, alfalfa, and clover. Rock picking may be required before a suitable irrigation system can be installed. Irrigation can be done by contour ditch, corrugation, and furrow methods.

Because annual precipitation is low and has poor seasonal distribution, this soil is not suited to nonirrigated crops. Stones and cobbles on the surface interfere with cultivation.

The potential plant community in rangeland areas of this soil consists mainly of bluebunch wheatgrass, western wheatgrass, Junegrass, galleta, needleandthread, and squirreltail. As range condition deteriorates, these grasses decrease, forbs and woody shrubs increase, and undesirable weeds and annual plants invade and become more abundant. Good range management is needed to maintain the grasses.

Seeding is not advisable in rangeland areas of this soil because of stones and cobbles on the surface.

This soil is used for winter range by mule deer. Big sagebrush, mountainmahogany, and bitterbrush are important browse species which can be managed for optimum production. This soil has some potential for habitat for blue grouse and band-tailed pigeon.

This soil is suited to most of the orchard crops grown in the survey area. The principal orchard crops grown on this soil are apples, pears, peaches, and cherries. Stoniness hinders the operation of farm machinery, and rock picking is a common practice. In areas where air drainage is poor, frost can severely damage the crops in spring. Cover crops are necessary to prevent erosion but should be managed so that they do not compete with trees. Application of fertilizer promotes the best growth of trees and the production of high quality fruit. Fertilizer requirements should be based on soil or foliage analysis. An intensive spray program is generally needed to control insects and disease.

If this soil is used for urban development, the main limitation is stoniness. If it is used for septic tank absorption fields, permeability is also a limitation. The limitations can be overcome by the use of proper design and construction methods.

This soil is in capability subclasses IVe, irrigated, and VIe, nonirrigated.

72—Scholle stony loam, 12 to 40 percent slopes. This is a deep, well drained soil. It formed in cobbly alluvium and is on old terraces, mesas, and benches. Elevation ranges from 5,800 to 7,000 feet. Average annual precipitation is about 13 inches, average annual

air temperature is about 46 degrees F, and the frost-free season is about 115 days.

Typically the surface layer is pinkish gray stony loam about 4 inches thick. The subsoil is brown or light brown gravelly clay loam about 16 inches thick. The substratum, to a depth of 60 inches, is very pale brown cobbly loam.

Permeability is moderate, and available water capacity is moderate. Effective rooting depth is 60 inches or more. Surface runoff is rapid. The hazard of erosion from wind is slight and from water is high.

Included with this soil in mapping are a few small areas of Agua Fria, Saraton, Radersburg, and Cerro soils. Also included are small areas that have a surface layer of loam, clay loam, or sandy loam. In steeper areas there are some small outcrops of shale or interbedded sandstone and small slips.

The native vegetation on this soil consists mainly of big sagebrush and widely scattered pinyon and juniper. Wheatgrasses, muttongrass, Indian ricegrass, and squirreltail are common grasses.

Most areas of this soil are in native vegetation and are used for grazing of livestock and wildlife and for recreational purposes.

Because annual precipitation is low and has poor seasonal distribution, this soil is not suited to nonirrigated crops. Where native grasses have been depleted or destroyed, a high degree of success can be expected from pasture plantings of nonirrigated grasses in spring, late in summer, and in fall to protect the soil from erosion and to provide grazing for livestock. Good pasture management must be practiced to maintain the grasses. Pubescent wheatgrass, Russian wildrye, and crested wheatgrass are adapted species.

The potential plant community in rangeland areas of this soil consists mainly of bluebunch wheatgrass, western wheatgrass, Junegrass, galleta, needleandthread, and squirreltail. As range condition deteriorates, these grasses decrease, forbs and woody shrubs increase, and undesirable weeds and annual plants invade and become more abundant. Good range management is needed to maintain the grasses.

Seeding is advisable in rangeland areas if range is in poor condition. Western wheatgrass, bluebunch wheatgrass, Indian ricegrass, and needleandthread are suitable for seeding. Grasses that meet the seasonal requirements of livestock should be selected. Preparing a seedbed and drilling the seed help to obtain the best results. Good pasture and range management is needed to maintain the grasses.

This soil is suited to Utah juniper and pinyon. It can produce 9 cords per acre in a stand in which tree trunks have an average diameter of 5 inches at a height of one foot. The main restrictions to its use for wood crops are surface stoniness and moderate hazard of erosion. Surface stoniness hinders equipment operations. Special attention must be given to minimize soil erosion during harvesting operations. Moderate available water capacity inhibits seedling survival.

This soil is used for winter range by mule deer. Big sagebrush, mountainmahogany, and bitterbrush are important browse species which can be managed for optimum production. In woodland areas this soil has some potential for habitat for blue grouse and band-tailed pigeon.

This soil is suited to most of the orchard crops grown in the survey area. The principal orchard crops grown on this soil are apples, pears, peaches, and cherries. Surface stoniness hinders the operation of farm machinery, and rock picking is a common practice. In areas where air drainage is poor, frost can severely damage the crops in spring. Cover crops are necessary to prevent erosion but should be managed so that they do not compete with trees. Application of fertilizer promotes the best growth of trees and the production of high quality fruit. Fertilizer requirements should be based on soil or foliage analysis. An intensive spray program is generally needed to control insects and disease.

If this soil is used for urban development, the main limitations are slope and stoniness. If it is used for septic tank absorption fields, permeability is also a limitation. The limitations can be overcome by the use of proper design and construction methods.

This soil is in capability subclass VIe, nonirrigated.

73—Shavano-Lazear complex, 3 to 12 percent slopes. These gently sloping, undulating, and moderately steep soils are on uplands. Elevation ranges from 4,800 to 6,000 feet. Average annual precipitation is about 10 inches, average annual air temperature is about 51 degrees F, and the average frost-free season is about 140 days.

The Shavano soil makes up about 40 percent of this complex. It is gently sloping and is in concave areas. The Lazear soil makes up about 40 percent of the complex. It is on the steeper side slopes and on ridgetops.

Included with these soils in mapping are a few small areas of Kech, Progresso, Glenton, and Utaline soils. Also included are small areas of Rock outcrop and of Torriorthents-Rock outcrop, sandstone, complex. Included areas make up 20 percent of the map unit.

The Shavano soil is moderately deep and well drained and overlies bedrock at a depth of 20 to 40 inches. It formed in locally transported material that was derived from sandstone and interbedded shale.

Typically the surface layer of the Shavano soil is light brown fine sandy loam about 14 inches thick. The underlying material is pink gravelly sandy clay loam. Partially weathered sandstone bedrock is at a depth of about 26 inches.

In the Shavano soil permeability is moderate and available water capacity is low. Effective rooting depth is about 26 inches. Surface runoff is medium. The hazard of erosion from wind is moderate and from water is moderate to high.

On the Shavano soil the native vegetation consists mainly of shadscale, snakeweed, mat and Gardner saltbush, fourwing saltbush, galleta, Indian ricegrass, and squirreltail (fig. 6).

The Lazear soil is shallow and well drained and overlies bedrock at a depth of 10 to 20 inches. It formed in material that was weathered in place from sandstone and interbedded shale.

Typically the surface layer of the Lazear soil is light brownish gray gravelly loam about 4 inches thick. The underlying material is light brown gravelly loam. Sandstone bedrock is at a depth of about 14 inches.

In the Lazear soil, permeability is moderate, and available water capacity is low. Effective rooting depth is about 15 inches. Surface runoff is medium. The hazard of erosion from wind is moderate and from water is moderate to high.

On the Lazear soil the native vegetation consists mainly of shadscale, snakeweed, mat and Gardner saltbush, fourwing saltbush, galleta, Indian ricegrass, and squirreltail.

Most areas of this complex are used for grazing by livestock and wildlife and for recreational purposes.

Because annual precipitation is low and has poor seasonal distribution, these soils are not suited to nonirrigated crops. However, nonirrigated pasture grasses can be planted late in summer and in fall to protect the soils from erosion and to provide limited grazing for livestock, if good pasture management is practiced. Siberian wheatgrass, western wheatgrass, Indian ricegrass, and crested wheatgrass are adapted species.

The potential plant community on these soils consists mainly of galleta, Indian ricegrass, Gardner saltbush, and shadscale. As range condition deteriorates, galleta and Indian ricegrass decrease, forbs and woody shrubs increase, and undesirable weeds and annual plants invade and become more abundant.

Seeding is advisable if range is in poor condition. Best results can be expected from sand dropseed, Indian ricegrass, and thickspike wheatgrass. Irrigation may be required in newly seeded areas until the plants are established. Preparing a seedbed and drilling the seed help to obtain the best results. Grasses that meet the seasonal requirements of livestock should be selected. Good range and pasture management is needed to maintain the grasses.

This soil is used for habitat for pronghorn antelope, desert cottontail, and mourning dove. Wildlife habitat can be improved by establishment of wildlife water developments and food plots in areas where water is available.

If these soils are used for urban development, the main limitations are depth to bedrock and corrosivity. The limitations can be overcome by the use of proper design and construction methods.

This complex is in capability subclass VIIe, nonirrigated.

74—Torriorthents-Haplargids complex, very stony. The soils in this complex are nearly level to strongly sloping and are on toe slopes and small fans and in narrow, winding valleys. They are forming in an accumulation of locally transported stony materials derived from a variety of rock. Slopes are 0 to 12 percent.

Torriorthents make up about 55 percent of this complex and are lower on the toe slopes than Haplargids and are in the bottom of small drainageways. Haplargids make up about 40 percent. They are more sloping than Torriorthents and are on toe slopes and fans.

Included with these soils in mapping are areas of Fluvents, flooded, that make up 5 percent of this map unit.

Torriorthents are deep and well drained. They have little or no profile development. The surface layer ranges from sandy loam to clay loam and is very stony. The underlying layers are sandy loam, loam, or clay loam and have cobbles, stones, and boulders. Content of rock fragments in the profile exceeds 35 percent.

Permeability of the Torriorthents is rapid to moderately slow. Available water capacity is moderate to low. Roots penetrate to a depth of 60 inches or more. Surface runoff is moderate. The stony surface layer helps to prevent erosion. Some areas are subject to rare flooding.

Haplargids are deep and well drained. These soils are highly variable, and profile development is weak to moderate. In some areas a thin, dark colored surface layer is forming. The surface layer most commonly is loam or sandy loam and is very stony. The subsoil is loam, clay loam, or light clay and has cobbles and stones. Content of rock fragments exceeds 35 percent.

Permeability of Haplargids is moderate to moderately slow. Available water capacity is moderate to low. Rooting depth is 60 inches or more. Surface runoff is medium. The stony surface layer helps to prevent erosion. Some areas are subject to rare flooding.

Because of surface stoniness and slope, these soils are unsuited to crops. Seedbed preparation and drilling of seed for pasture plantings on depleted native range or in cleared areas are generally not practical because of surface stoniness. A limited degree of success can be expected by broadcasting seed late in summer or early in fall. Siberian wheatgrass, western wheatgrass, Indian ricegrass, and crested wheatgrass are adapted species. Good pasture management must be practiced to protect the soils from erosion and to provide grazing for livestock.

These soils provide habitat for desert cottontail, mourning dove, and chukar. Water developments can be used to improve wildlife habitat.

If these soils are used for urban development, the main limitations are stoniness and overflow. These limitations can be overcome by the use of proper design and construction methods.

This complex is in capability subclass VIIs, nonirrigated.

75—Torriorthents-Rock outcrop, sandstone, complex. This broadly defined map unit consists of moderately steep to very steep soils and Rock outcrop on mountainsides and foot slopes. Torriorthents make up about 60 percent of the map unit, and sandstone rock outcrops make up about 30 percent (fig. 7). Slopes are 20 to 70 percent.

Torriorthents most commonly occur in the less sloping areas and are lower on the foot slopes than the rock outcrops. The sandstone rock outcrops generally are steeper than the Torriorthents. Rock escarpments commonly occur on the upper part of the slopes.

Included with this complex in mapping are small areas of Kech and Progresso soils and Fluvents, flooded.

Torriorthents are well drained. Depth to bedrock ranges from 10 to more than 60 inches. The deeper Torriorthents are near the bottom of the slope. The surface layer is generally loamy and is very stony, because rocks weathered from escarpments are carried downslope by gravity. The underlying layers are sandy loam or loam and have a high content of rock fragments. Stones that are many feet in diameter are common.

Permeability of Torriorthents is moderate to rapid, and available water capacity is moderate to low. Depth to bedrock limits rooting depth, but tree roots commonly penetrate fractures in the rock. Surface runoff is rapid. Surface stoniness helps to prevent water erosion. Mass wasting is common in areas of this map unit.

The Rock outcrop part of this complex consists of more than 90 percent exposed bedrock, principally sandstone. It provides cover for wildlife and is used mainly for wildlife habitat and recreation.

The soils in this complex have only limited value for grazing and are used mainly for wildlife habitat and recreation. Vegetative cover is needed to control runoff and erosion. This map unit provides cover and escape for wildlife. Deer commonly feed on the sunny slopes during winter.

Because of surface stoniness and slope, the soils in this complex are unsuited to crops, and seedbed preparation and drilling of seed for pasture plantings on depleted native range or in cleared areas are generally not practical. A limited degree of success can be expected by broadcasting seed late in summer or early in fall. Siberian wheatgrass, western wheatgrass, Indian ricegrass, and crested wheatgrass are adapted species. Good pasture management must be practiced to protect the soil from erosion and to provide grazing for livestock.

If this map unit is used for urban development, the main soil limitations are slope and stoniness. These limitations can be overcome by the use of proper design and construction methods.

This complex is in capability subclass VIIs, nonirrigated.

76—Torriorthents-Rock outcrop, shale, complex. This broadly defined map unit consists of moderately steep to very steep soils and Rock outcrop on uplands, pediments, and side slopes of mesas. Torriorthents make up about 55 percent of the map unit, and shale rock outcrops make up about 35 percent. Torriorthents are less sloping than the rock outcrops and are near the base of the slope. The rock outcrops are steeper than Torriorthents. Slopes are 15 to 70 percent.

Included with this unit in mapping are small areas of Badland and of Mesa, Agua Fria, and Utaline soils.

Torriorthents are well drained. Depth to shale bedrock ranges from 10 to more than 60 inches. The deeper areas are near the base of the slope. The surface layer is silty clay loam or silty clay. The underlying layers are silty clay loam to silty clay. On side slopes of mesas and on pediments, cobbles and stones that have been carried downslope by gravity are on the surface.

Permeability of Torriorthents is slow or very slow. Available water capacity depends upon soil depth and is higher where the soils are deeper. Rooting depth ranges from 10 to more than 60 inches. Surface runoff is rapid to very rapid, and the hazard of erosion is high. Erosion is active most of the time on the steeper slopes, and the mass movement of soil material is common. Areas of this complex produce a large amount of sediment.

The Rock outcrop part of this complex consists of more than 90 percent exposed bedrock, mainly shale. It provides cover for wildlife and is used mainly for wildlife habitat and recreation.

The soils in this complex have limited value for grazing and are used mainly for wildlife habitat and recreation. Vegetative cover is needed to control runoff and erosion. This map unit provides cover for wildlife. Deer commonly feed on the sunny slopes during winter.

Because of instability and steep slopes, the soils in this map unit are unsuited to farming. Seedbed preparation and drilling of seed for pasture plantings are not practical. A limited degree of success can be expected by broadcasting seed late in summer and early in fall. Western wheatgrass, crested wheatgrass, and alkali sacaton are adapted species. Good pasture management must be practiced to protect the soil from erosion. Areas of this map unit produce a large amount of sediment.

If this map unit is used for urban development, a detailed onsite investigation is needed to determine soil characteristics and limitations.

This complex is in capability subclass VIIIe.

77—Uffens sandy loam, 0 to 5 percent slopes. This is a deep, well drained soil. It formed in alkaline alluvium and is on fans and terraces. Elevation ranges from 4,600 to 5,500 feet. Average annual precipitation is about 9 inches, average annual air temperature is about 49 degrees F, and the average frost-free season is about 140 days.

Typically the surface layer is light gray sandy loam about 3 inches thick. The subsoil is very strongly alkaline, pinkish gray sandy clay loam about 11 inches thick. The substratum, to a depth of 60 inches, is strongly alkaline, pinkish gray sandy loam.

Permeability is moderately slow, and available water capacity is moderate. Effective rooting depth is 60 inches or more. Surface runoff is slow to medium. The hazard of erosion from wind is moderate and from water is slight to moderate.

Included with this soil in mapping are a few small areas of Glenton soils; Fluvents, flooded; and Fluvaquents, flooded. In some areas the surface layer is loamy sand. Wind erosion has formed hummocks 10 to 20 feet in diameter and has thinned the surface layer between these hummocks.

The native vegetation on this soil consists mainly of greasewood, fourwing saltbush, shadscale, and saltgrass.

This soil is best suited to grazing of livestock and wildlife and to recreational purposes. A few small areas are irrigated and are used for hay and pasture crops.

Because of high sodium content and low annual precipitation, this soil is not suited to nonirrigated crops. However, nonirrigated pasture grasses can be planted late in summer and in fall to protect the soil from erosion and to provide limited grazing for livestock, if good pasture management is practiced. Tall wheatgrass, western wheatgrass, and alkali sacaton are adapted species.

The potential plant community on this soil consists mainly of greasewood, big sagebrush, galleta, and western wheatgrass. As range condition deteriorates, galleta and western wheatgrass decrease, forbs and woody shrubs increase, and undesirable weeds and annual plants invade and become more abundant.

Seeding has a limited chance of success but may be advisable if range is in poor condition. Best results can be expected from Indian ricegrass, sand dropseed, and western wheatgrass. Irrigation may be required in newly seeded areas until the plants are established. Preparing a seedbed and drilling the seed help to obtain the best results. Grasses that meet the seasonal requirements of livestock should be selected. Seeded areas should be fenced.

This soil provides habitat for desert cottontail, mourning dove and chukar. Where water is available, water developments and food plots can be used to improve wildlife habitat. Fourwing saltbush is an important wildlife plant that grows on this soil.

If this soil is used for urban development, the main limitation is corrosivity. If it is used for septic tank absorption fields, permeability is the main limitation. The limitations can be overcome by the use of proper design and construction methods.

This soil is in capability subclasses VIs, irrigated, and VIIs, nonirrigated.

78—Utaline sandy loam, 3 to 12 percent slopes. This is a deep, well drained soil. It formed in stony and cobbly outwash and is on old, high terraces, fans, and mesas. Elevation ranges from 4,800 to 6,000 feet. Average annual precipitation is about 12 inches, average annual air temperature is about 50 degrees, and the average frost-free season is about 140 days.

Typically the surface layer is pink sandy loam about 4 inches thick. The upper part of the underlying material is pink very cobbly loam about 14 inches thick, and the lower part, to a depth of 60 inches, is pinkish white or pinkish gray extremely cobbly loam.

Permeability is moderate, and available water capacity is moderate. Effective rooting depth is 60 inches or more. Surface runoff is moderate. The hazard of erosion from wind is slight to moderate and from water is moderate to high.

Included with this soil in mapping are a few small areas of Mesa, Avalon, Saraton, and Agua Fria soils. In some areas the surface layer is stony loam or light clay loam.

The native vegetation on this soil consists mainly of galleta, Indian ricegrass, muttongrass, squirreltail, sagebrush, cactus, and shadscale.

Some areas of this soil are used for grazing of livestock and wildlife and for recreational purposes. Some areas are irrigated and are used mainly for corn, hay, pasture, small grains, and orchard crops.

This soil is suited to all of the crops commonly grown in the survey area, including those which require a very long growing season. Extreme care is needed to prevent wind and water erosion. The soil should be maintained in grasses, legumes, or close-growing crops at least three-fourths of the time. Row crops in rotation should be grown no more than one year. Moisture intake rate is high, and the soil is easy to work. Because of moderate available water capacity, frequent application of irrigation water is necessary. Land leveling, good management of irrigation water, and use of crop residue help to conserve irrigation water, control erosion, and maintain organic matter content. Using green manure crops, including grasses and legumes in the cropping system, and minimum tillage also help to maintain organic matter content and reduce loss of moisture.

This soil can be used for irrigated pasture and hay crops. It is well suited to smooth brome, orchardgrass, tall wheatgrass, alfalfa, and clover. Irrigation can be done by contour ditch, corrugation, and furrow methods.

Because annual precipitation is low and has poor seasonal distribution, this soil is unsuited to nonirrigated crops. However, nonirrigated pasture grasses can be planted late in summer and in fall to protect the soil from erosion and to provide grazing for livestock. Siberian wheatgrass, crested wheatgrass, Russian wildrye, and tall wheatgrass are adapted species.

The potential plant community on this soil consists mainly of galleta, Indian ricegrass, and shadscale. As range condition deteriorates, galleta and Indian ricegrass decrease, forbs and woody shrubs increase, and undesirable weeds and annual plants invade and become more abundant.

Seeding is advisable in selected areas if range is in poor condition. Seeding is limited to areas where no stones are on the surface. Best results can be expected from Indian ricegrass and galleta. Irrigation may be required in newly seeded areas until the plants are established. Preparing a seedbed and drilling the seed help to obtain the best results. The seed can be broadcast in areas where the soil is too stony for drilling. Grasses that meet the seasonal requirements of livestock should be selected. Seeded areas should be fenced.

This soil provides habitat for pronghorn antelope, desert cottontail, and mourning dove. Where water is available, water developments and food plots can be used to improve wildlife habitat. Fourwing saltbush is an important wildlife plant that can be established on this soil.

This soil is suited to most of the orchard crops grown in the survey area. The principal orchard crops on this soil are apples, pears, peaches, and cherries. In areas where air drainage is poor, frost can severely damage the fruit crop in spring. Cover crops are necessary to control erosion but should be managed so that they do not compete with fruit trees. Application of fertilizer promotes the best growth of trees and the production of high quality fruit. Fertilizer requirements should be based on soil or foliage analysis. An intensive spray program is generally needed to control insects and disease. Estimated average yields per acre for some of the orchard crops grown on this soil are as follows: apples, 700 bushels; peaches, 550 bushels; cherries, 700 bushels; and pears, 550 bushels.

If this soil is used for urban development, the main limitations are stoniness and corrosivity. The limitations can be overcome by the use of proper design and construction methods.

This soil is in capability subclasses IVe, irrigated, and VIIe, nonirrigated.

79—Utaline stony loam, 3 to 30 percent slopes. This is a deep, well drained soil. It formed in stony and cobbly outwash and is on old, high terraces, fans, and mesas. Elevation ranges from 4,800 to 6,000 feet. Average annual precipitation is about 12 inches, average annual air temperature is about 50 degrees F, and the average frost-free season is about 140 days.

Typically the surface layer is pink stony loam about 4 inches thick. The upper part of the underlying material is pink very cobbly loam about 14 inches thick, and the lower part, to a depth of 60 inches, is pinkish white to pinkish gray extremely cobbly loam.

Permeability is moderate, and available water capacity is moderate. Effective rooting depth is 60 inches or more. Surface runoff is moderate to rapid. The hazard of erosion from wind is slight and from water is moderate.

Included with this soil in mapping are a few small areas of Mesa, Avalon, and Saraton soils and some areas of Torriorthents-Rock outcrop, shale, complex. Also included are areas of Persayo soils where the alluvial mantle overlying shale has been removed.

The native vegetation on this soil consists mainly of galleta, Indian ricegrass, squirreltail, shadscale, bud sagebrush, and tall rabbitbrush.

Most areas of this soil are used for grazing of livestock and wildlife and for recreational purposes.

Because of surface stoniness and slope, this soil is unsuited to crops. Seedbed preparation and drilling of seed for pasture plantings on depleted native range or in cleared areas are generally not practical because of surface stoniness (fig. 8). A limited degree of success can be expected by broadcasting seed late in summer and early in fall. Siberian wheatgrass, tall wheatgrass, Russian wildrye, and crested wheatgrass are adapted species. Good pasture management must be practiced to protect the soil from erosion and to provide grazing for livestock.

The potential plant community on this soil consists mainly of galleta, Indian ricegrass, and shadscale. As range condition deteriorates, galleta and Indian ricegrass decrease, forbs and woody shrubs increase, and undesirable weeds and annual plants invade and become more abundant.

Seeding is advisable if range is in poor condition, but only in selected areas where no stones are on the surface. Best results can be expected from Indian ricegrass and galleta. Irrigation may be required in newly seeded areas until the plants are established. Preparing a seedbed and drilling the seed help to obtain the best results. Some success can be expected from broadcasting of seed. Grasses that meet the seasonal requirements of livestock should be selected. Seeded areas should be fenced.

This soil provides habitat for pronghorn antelope, desert cottontail, and mourning dove. Where water ia available, water developments and food plots can be used to improve wildlife habitat. Fourwing saltbush is an important wildlife plant that can be established on this soil.

If this soil is used for urban development, the main limitations are stoniness, slope, and corrosivity. The limitations can be overcome by the use of proper design and construction methods.

This soil is in capability subclass VIIs, nonirrigated.

80—Utaline-Torriorthents complex. These soils are moderately steep to very steep and are on side slopes of mesas, benches, and pediments. Elevation ranges from 4,800 to 6,200 feet. Average annual precipitation is about 12 inches, average annual air temperature is about 50 degrees F, and the average frost-free season is about 130 days. Slopes range from 20 to 60 percent.

The Utaline soil makes up about 50 percent of this complex. It is in the less sloping, lower part of the slope. Torriorthents make up about 30 percent. They are on the steeper part of side slopes and on small ridgetops.

Included with these soils in mapping are areas of Mesa soils and Badland. Small slips and slides occur in places. Included areas make up 20 percent of the map unit.

The Utaline soil is deep and well drained. It formed in old landslide deposits and glacial outwash derived from material of mixed origin.

Typically the surface layer of the Utaline soil is pink stony loam about 4 inches thick. The upper part of the underlying material is pink very cobbly loam about 14 inches thick. The lower part, to a depth of 60 inches, is pinkish white to pinkish gray extremely cobbly loam.

Torriorthents generally are highly variable. Development of a soil profile is absent or slight in most places. In some areas shale bedrock is near the surface. Available water capacity of Torriorthents is limited but is higher where the soil is deeper. Surface runoff is rapid, and the hazard of erosion is high. A vegetative cover is needed to control runoff and erosion.

The native vegetation in areas of Torriorthents consists mainly of mat saltbush, shadscale, fourwing saltbush, rabbitbrush, galleta grass, Indian ricegrass, and squirreltail.

Permeability and available water capacity are moderate. Effective rooting depth is 60 inches. Surface runoff is moderate to rapid. The hazard of erosion from wind is slight and from water is moderate to high. Surface stoniness helps to control erosion.

The native vegetation on the Utaline soil consists mainly of galleta, Indian ricegrass, squirreltail, shadscale, and tall rabbitbrush. Some success can be expected from broadcasting of seed. Grasses that meet the seasonal requirements of livestock should be selected. Seeded areas should be fenced.

Because of instability of the soils and steep slopes, these soils are unsuited to farming. Seedbed preparation and drilling of seed for pasture plantings are not practical. A limited degree of success can be expected by broadcasting of seed late in summer or early in fall. Western wheatgrass, crested wheatgrass, and alkali sacaton are adapted species. Good pasture management must be practiced to protect the soils from erosion.

These soils provide habitat for pronghorn antelope, desert cottontail, and mourning dove. Where water is available, water developments and food plots can be used to improve wildlife habitat. Fourwing saltbush is an important wildlife plant that grows on these soils.

If these soils are used for urban development, the main limitations are stoniness, slope, and corrosivity. The limitations can be overcome by the use of proper design and construction methods.

This complex is in capability subclass VIIe, nonirrigated.

81—Work loam, 3 to 6 percent slopes. This is a deep, well drained soil. It formed in reworked material that was weathered from sandstone and is on uplands and alluvial fans and in small depressions. Elevation ranges from 6,500 to 8,500 feet. Average annual precipitation is about 17 inches, average annual air temperature is about 44 degrees F, and the average frost-free season is about 90 days.

Typically the surface layer is dark brown loam about 6 inches thick. The subsoil is brown clay or clay loam about 33 inches thick. The substratum, to a depth of 60 inches, is very pale brown channery loam.

Permeability is moderately slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Surface runoff is medium. The hazard of erosion from wind is slight and from water is moderate.

Included with this soil in mapping are a few small areas of Absarokee, Beenom, Potts, and Kech soils. In some areas the surface layer is fine sandy loam or loam. Also included are areas where sandstone is at a depth of 40 to 60 inches. In places the soil is channery below the subsoil.

The native vegetation on this soil consists mainly of wheatgrasses, bluegrasses, bromes, big sagebrush, oakbrush, and serviceberry.

This soil is used for grazing of livestock and wildlife and for recreational purposes. Some areas are irrigated and are used mainly for hay, small grains, and pasture.

This soil is suited to all of the crops commonly grown in the survey area, except those which require a long growing season. Extreme care is necessary to prevent water erosion. Maintaining organic matter content is important. The soil should be kept in grasses, legumes, or close-growing crops at least one-fourth of the time, and row crops in rotation should be grown no more than 3 years consecutively. Use of crop residue, land leveling, good management of irrigation water, and use of cover crops and green manure crops help to maintain organic matter content and to control erosion. Shortness of the growing season may limit yields and the choice of crops.

This soil can be used for irrigated pasture and hay crops. It is well suited to alfalfa, smooth brome, orchardgrass, intermediate wheatgrass, and clover. Irrigation can be done by contour ditch, corrugation, and furrow methods.

Because annual precipitation is low and has poor seasonal distribution, this soil is not suited to nonirrigated crops. However, nonirrigated pasture grasses can be planted late in summer and in fall to protect the soil from erosion and to provide grazing for livestock, if good pasture management is practiced. Crested wheatgrass, smooth brome, and intermediate wheatgrass are adapted species.

The potential plant community on this soil consists mainly of wheatgrasses, bluegrasses, and needlegrasses. As range condition deteriorates, wheatgrasses and needlegrasses decrease, forbs and woody shrubs increase, and undesirable weeds and annual plants invade and become more abundant.

Seeding is advisable if range is in poor condition. Bluebunch wheatgrass, western wheatgrass, and big blue-

grass are suitable for seeding. Grasses that meet seasonal requirements of livestock should be selected. Preparing a seedbed and drilling the seed help to obtain the best results. On some sites, control of competing shrubs is required to improve range condition. Seeded areas should be fenced.

This soil is used for winter range by mule deer and elk. Some important plant species which can be managed for optimum production are bitterbrush, mountainmahogany, Gambel oak, serviceberry, and elk sedge. Berry-producing shrubs are an important habitat element of black bear. This soil provides habitat for Merriam turkey, blue grouse, and band-tailed pigeon. In favorable years mature Gambel oaks produce acorns, which are used by Merriam turkey.

If this soil is used for urban development, the main limitations are shrink-swell potential and corrosivity. If it is used for septic tank absorption fields, permeability is the main limitation. The limitations can be overcome by the use of proper design and construction methods.

This soil is in capability subclasses IVe, irrigated, and VIe, nonirrigated.

82—Work loam, 6 to 12 percent slopes. This is a deep, well drained soil. It formed in reworked material that was weathered from sandstone and is on uplands and alluvial fans and in depressions. Elevation ranges from 6,500 to 8,500 feet. Average annual precipitation is about 17 inches, average annual air temperature is about 44 degrees F, and the average frost-free season is about 90 days.

Typically the surface layer is dark brown loam about 6 inches thick. The subsoil is brown clay or clay loam about 33 inches thick. The substratum, to a depth of 60 inches, is very pale brown channery loam.

Permeability is moderately slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Surface runoff is rapid. The hazard of erosion from wind is slight and from water is high.

Included with this soil in mapping are a few small areas of Absarokee, Beenom, Potts, and Kech soils. Also included are small areas of stony and very stony soils. In some areas the surface layer is sandy loam or loam. The soil is channery below the subsoil in places. Also included are areas where sandstone is at a depth of 40 to 60 inches.

The native vegetation on this soil consists mainly of wheatgrasses, bluegrasses, bromes, big sagebrush, oakbrush, and serviceberry.

Some areas of this soil are used for grazing of livestock and wildlife and for recreational purposes. Some areas are irrigated and are used mainly for hay, small grains, and pasture.

This soil is suited to all of the crops commonly grown in the survey area, except those which require a long growing season. Extreme care is necessary to prevent water erosion. Maintaining organic matter content is important. The soil should be kept in grasses, legumes, or close-growing crops at least one-fourth of the time, and row crops in rotation should be grown no more than 3 years consecutively. Use of crop residue, land leveling, good management of irrigation water, and using cover crops and green manure crops help to maintain the organic matter content and to control erosion. Shortness of the growing season may limit yields and the choice of crops.

This soil can be used for irrigated pasture and hay crops. It is well suited to alfalfa, smooth brome, orchardgrass, intermediate wheatgrass, and clover. Irrigation can be done by contour ditch and corrugation methods.

Because of low annual precipitation and the seasonal distribution of moisture, this soil is not suited to nonirrigated crops. However, nonirrigated pasture grasses can be planted late in summer and in fall to protect the soil from erosion and to provide grazing for livestock, if proper pasture management is practiced. Crested wheatgrass, pubescent wheatgrass, smooth brome, and hard fescue are adapted species.

The potential plant communiy on this soil consists mainly of wheatgrasses, bluegrasses, and needlegrasses. As range condition deteriorates, wheatgrasses and needlegrasses decrease, forbs and woody shrubs increase, and undesirable weeds and annual plants invade and become more abundant.

Seeding is advisable if range is in poor condition. Bluebunch wheatgrass, western wheatgrass, and big bluegrass are suitable for seeding. Grasses that meet the seasonal requirements of livestock should be selected. Preparing a seedbed and drilling the seed help to obtain the best results. On some sites, control of competing shrubs is required to improve range condition. Seeded areas should be fenced.

This soil is used for winter range by mule deer and elk. Important plant species which should be managed include bitterbrush, mountainmahogany, Gambel oak, serviceberry, and elk sedge. Berry-producing shrubs are an important habitat element of black bear. This soil provides habitat for Merriam turkey, blue grouse, and band-tailed pigeon. In favorable years mature Gambel oaks produce acorns, which are used by Merriam turkey.

If this soil is used for urban development, the main limitations are shrink-swell potential and corrosivity. If it is used for septic tank absorption fields, permeability is the main limitation. The limitations can be overcome by the use of proper design and construction methods.

This soil is in capability subclasses IVe, irrigated, and VIe, nonirrigated.

83—Work loam, 12 to 25 percent slopes. This is a deep, well drained soil. It formed in reworked material that was weathered from sandstone and is on uplands and fans. Elevation ranges from 6,500 to 8,500 feet. Average annual precipitation is about 17 inches, average annual air temperature is about 44 degrees F, and the average frost-free season is about 90 days.

Typically the surface layer is dark brown loam about 6 inches thick. The subsoil is brown clay or clay loam about 33 inches thick. The substratum, to a depth of 60 inches, is very pale brown channery loam.

Permeability is moderately slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Surface runoff is rapid. The hazard of erosion from wind is slight and from water is high.

Included with this soil in mapping are a few small areas of Absarokee and Beenom soils. Also included are small areas of stony or very stony soils. In some areas the surface layer is sandy loam or loam. The soil is channery below the subsoil in some places. Also included are areas where sandstone is at a depth of 40 to 60 inches.

The native vegetation on this soil consists mainly of wheatgrasses, bluegrasses, bromes, big sagebrush, oakbrush, and serviceberry.

Most areas of this soil are used for grazing of livestock and wildlife and for recreational purposes.

Because annual precipitation is low and has poor seasonal distribution, this soil is not suited to nonirrigated crops. Where native grasses have been depleted or destroyed, a high degree of success can be expected from pasture plantings of nonirrigated grasses in spring, late in summer, and in fall to protect the soil from erosion and to provide grazing for livestock. Good pasture management must be practiced to maintain the grasses. Smooth brome, pubescent wheatgrass, and crested wheatgrass are adapted species.

The potential plant community on this soil consists mainly of wheatgrasses, bluegrasses, and needlegrasses. As range condition deteriorates, wheatgrasses and needlegrasses decrease, forbs and woody shrubs increase, and undesirable weeds and annual plants invade and become more abundant.

Seeding is advisable if range is in poor condition. Bluebunch wheatgrass, western wheatgrass, and big bluegrass are suitable for seeding. Grasses that meet the seasonal requirements of livestock should be selected. Preparing a seedbed and drilling the seed help to obtain the best results. On some sites, control of competing shrubs is required to improve range condition. Seeded areas should be fenced.

This soil is used for winter range by mule deer and elk. Some important plant species which can be managed for optimum production are bitterbrush, mountainmahogany, Gambel oak, serviceberry, and elk sedge. Berry-producing shrubs are an important habitat element of black bear. This soil provides habitat for Merriam turkey, blue grouse, and band-tailed pigeon. In favorable years mature Gambel oaks produce acorns, which are used by Merriam turkey.

If this soil is used for urban development, the main limitations are slope, shrink-swell potential, and corrosivity. If this soil is used for septic tank absorption fields, permeability is the main limitation. The limitations can be overcome by the use of proper design and construction methods.

This soil is in capability subclass VIe, nonirrigated.

Use and management of the soils

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

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

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

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

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

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

Crops and pasture

L. D. Short, district conservationist, Soil Conservation Service, helped to prepare this section.

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

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

More than 45,000 acres in the survey area were used for irrigated crops and pasture in 1967, according to the Conservation Needs Inventory. Of this total, 6,335 acres was used for fruit crops; 2,500 acres for row crops, mainly corn; 2,800 acres for close-grown crops, mainly barley and oats; and 32,000 acres for rotation hay and pasture. The rest was idle cropland.

The potential of soils in the survey areas for increased production of food is good. Food production can be increased considerably by extending the latest crop production technology to all cropland in the survey area. Information in this soil survey can greatly facilitate the application of such technology.

Acreage in crops and pasture has gradually been decreasing as more land is used as rural homesites and for urban development. The use of this soil survey to help make land use decisions that will influence the future role of farming in the county is discussed in the section "General soil map for broad land use planning."

Soil erosion, sedimentation, and salinity are the major soil problems on about three-fourths of the cropland and pastureland in the survey area. If slope is more than 2 percent, erosion is a hazard. In some areas of Avalon, Mesa, and Billings soils, for example, slope is more than 2 percent.

Loss of the surface layer through erosion is damaging for two reasons. First, productivity is reduced because the surface layer is lost and part of the subsoil is mixed with the plow layer. Loss of the surface layer is especially damaging on soils that have a clayey subsoil, for example, Mesa, Agua Fria, and Work soils; on soils that have a layer that limits the depth of the root zone in or below the subsoil; and on soils in which the root zone is restricted by bedrock, for example, Kech, Progresso, Beenom, and Absarokee soils. Erosion also reduces productivity on soils that tend to be droughty, for example, Radersburg and Cliffdown soils. Second, loss of the surface layer through erosion increases sedimentation in streams. Control or erosion minimizes sedimentation, thus, improving the quality of water for municipal and recreational uses and for fish and wildlife.

In many sloping fields, seedbed preparation and tillage are difficult in clayey or hardpan spots because the original friable surface soil has been eroded. Such spots are common in areas of moderately eroded Limon and Billings soils.

Erosion control practices provide protective surface cover, reduce runoff, and increase infiltration. A cropping system that keeps vegetative cover on the soil for extended periods can hold soil losses from erosion to an amount that will not reduce the productive capacity of the soils. On livestock farms, which require pasture and hay, the legumes and grasses in the cropping system reduce erosion on sloping land. They also provide nitrogen and improve tilth for the next crop.

Wind erosion is a hazard on all of the soils if they do not have vegetative cover. Strong wind can damage these soils in a few hours if the soils are dry. Maintaining a vegetative cover or roughing the surface through proper tillage minimizes wind erosion on these soils.

Soil drainage is the major management need on about one-sixth of the acreage used for crops and pasture in the survey area. Some of the soils, for example, Apishapa soils, are so wet that crops generally cannot be grown unless artificial drainage is installed.

Subsurface drainage systems should be designed according to the kind of soil. Irrigation and tile drainage generally are needed in some combination on poorly drained and very poorly drained soils that are used intensively for row crops. Drains have to be more closely spaced in soils that have slow permeability than in soils that have more rapid permeability. Tile drainage is slow in Limon and Billings soils, and locating adequate outlets for tile drainage systems is difficult in many areas of Glenton soils.

Soil fertility is naturally low in most of the soils in the survey area, mainly in available phosphorus, nitrogen, and potash, and trace elements are needed to grow some special crops. For all crops, application of fertilizer should be based on the results of soil tests, on the crop to be grown, and on the expected level of yields. The Cooperative Extension Service can help in determining the kind and amount of fertilizer that is needed.

Soil tilth affects seed germination and the rate of water infiltration. Soils that have good tilth are granular and porous and have an adequate content of organic matter. Most of the soils used for crops in the survey area have a surface layer of clay loam that is light in color and low in content of organic matter. Generally, the structure of these soils is weak, and rainfall causes a crust to form on the surface. This crust reduces the rate

of water infiltration and increases runoff. Regular addition of crop residue, manure, and other kinds of organic matter can help to improve soil structure and to reduce erosion.

Fall plowing is generally beneficial on soils that have a surface layer of clay loam. Freezing and thawing during winter improve soil tilth for seedbed preparation in spring. Proper seedbed preparation generally is difficult in spring because the soils are dry and cloddy. As a result, irrigation is used to grow crops planted early in spring.

Irrigation is necessary for most of the crops grown in the survey area, although snow and rain provide moisture for growth of native plants. Management of irrigation water is essential to promote the desired crop response, to minimize losses of soil and of plant nutrients, and to prevent seepage from deep percolation.

Land leveling, use of lined ditches and irrigation pipelines, installation of water control structures, use of proper methods of irrigation, and intense management of irrigation water help to conserve irrigation water.

Field crops to which the soils and climate of the survey area are suited include some crops that are not commonly grown. Corn, corn for silage, sugar beets, and beans are the row crops commonly grown. Oats, feed barley, and, on a small acreage, wheat, are close-growing crops. Oats are used as a cover crop for new seedings of alfalfa for hay. Grass seed is produced on some farms for commercial markets. Most of the soils that are irrigated are used for hay and pasture because of slope, the small size and irregular shape of fields, and the shortage of irrigation water late in summer.

Orchard crops are important to the economy of the survey area. The main orchard crops are apples, peaches, cherries, and pears. About 6,335 acres are in commercial fruit trees.

In selecting a site for orchard crops, air drainage should be considered. Spring frost that occurs shortly before, during, and after the trees bloom is a severe hazard. Cold air tends to settle in low areas. On windless, cold nights the temperature in depressions may be several degrees colder than surrounding higher areas.

Soil properties affect the suitability of sites for orchard crops. Shallow soils are poorly suited to orchard crops, but soils that are too steep or stony for most farm crops can be well suited to orchard crops. Soils that are poorly drained or have poor aeration generally are poorly suited to orchard crops.

Woodland makes up about 12,000 acres of privately owned land in the survey area that is suitable for commercial production of trees. This acreage consists mainly of aspen growing on Cochetopa and Northwater soils. It also includes cottonwood grown on Glenton soils and Haplaquolls, flooded, and pinyon and juniper grown on Agua Fria, Gaynor, Kech, Midway, Progresso, Radersburg, Razor, Saraton, and Scholle soils. Suitability of the soils for trees is discussed in the descriptions of map units in the section "Soil maps for detailed planning."

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

Yields per acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 11. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors. Absence of an estimated yield indicates that the crop is not suited to or not commonly grown on the soil or that a given crop is not commonly irrigated.

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

The yields were estimated assuming that the latest soil and crop management practices were used. Hay and pasture yields were estimated for the most productive varieties of grasses and legumes suited to the climate and the soil. A few farmers may be obtaining average yields higher than those shown in table 11.

The management needed to achieve the indicated yields of the various crops depends on the kind of soil and the crop. Such management provides drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate tillage practices, including time of tillage and seedbed preparation and tilling when soil moisture is favorable; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residues, barnyard manure, and green-manure crops; harvesting crops with the smallest possible loss; and timeliness of all fieldwork.

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

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

Crops other than those shown in table 11 are grown in the survey area, but estimated yields are not included because the acreage of these crops is small. The local offices of the Soil Conservation Service and the Cooperative Extension Service can provide information about

the management concerns and productivity of the soils for these crops.

Capability classes and subclasses

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

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

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

Class I soils have few limitations that restrict their use.

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

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

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

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

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

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

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

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

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

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

Rangeland

Jim Kellogg, range conservationist, Soil Conservation Service, helped to prepare this section.

Rangeland makes up about 412,000 acres in the survey area. Although production per acre on rangeland is much lower than that on irrigated land, the total production is very high because of the vast acreage. The cow-calf operation is by far the most common type. Ranches range from 400 to 900 acres in size of deeded land. Land managed by the Bureau of Land Management and the Forest Service is also used.

Privately owned rangeland is grazed mainly in spring and fall, and land managed by the Bureau of Land Management and the Forest Service generally is grazed in summer. In spring, livestock are range fed, supplemented with grazing in early pastures, and are also fed hay.

Much of the native rangeland in the survey area is depleted because sagebrush production is higher than would generally be expected in the potential plant community. As production of sagebrush increases, production of grasses decreases. Productivity of rangeland can be increased by using management practices that are effective on specific soils and range sites.

Productivity is also affected by the amount of precipitation. Range sites at the lowest elevations, where annual precipitation ranges from 8 to 10 inches, have a lower potential productivity than range sites at the highest elevations where annual precipitation ranges from 18 to 20 inches.

A major management concern on rangeland in the survey area is reducing accelerated erosion by improving the condition of range. This can be done by the use of one or a combination of conservation practices: deferred grazing, proper grazing use, fencing, water development, brush management, range seeding, and use of a planned system of grazing that rests the soil at least one year in three. Sound range management that is based on range inventories and information in this survey can reduce erosion, improve the condition of range, and increase the productivity of rangeland in the survey area.

Where climate and topography are about the same, differences in the kind and amount of vegetation that rangeland can produce are related closely to the kind of

soil. Effective management is based on the relationships among soils, vegetation, and water.

Table 12 shows, for each kind of soil, the name of the range site; the total annual production of vegetation in favorable, normal, and unfavorable years; the characteristic vegetation; and the expected percentage of each species in the composition of the potential natural plant community. Soils not listed cannot support a natural plant community of predominately grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. The following are explanations of column headings in table 12.

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

Total production refers to the amount of vegetation that can be expected to grow annually on well managed rangeland that is supporting the potential natural plant community. It is expressed in pounds per acre of air-dry vegetation for favorable, normal, and unfavorable years. In a favorable year the amount and distribution of precipitation and the temperatures are such that growing conditions are substantially better than average; in a normal year these conditions are about average for the area; in an unfavorable year, growing conditions are well below average, generally because of low available soil moisture.

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

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

Range management requires, in addition to knowledge of the kinds of soil and the potential natural plant community, an evaluation of the present condition of the range vegetation in relation to its potential. Range condition is determined by comparing the present plant community with the potential natural plant community on a particular range site. The more closely the existing community resembles the potential community, the better the range condition. The objective in range management is to control grazing so that the plants growing on a site are about the same in kind and amount as the potential natural plant community for that site. Such management generally results in the maximum production of vegetation, conservation of water, and control of erosion. Sometimes, however, a range condition somewhat below the potential meets grazing needs, provides wildlife habitat, and protects soil and water resources.

Engineering

Floyd Kelly, Jr., area engineer, Soil Conservation Service, helped to prepare this section.

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

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

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

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

These factors of soil behavior affect construction and maintenance of roads, airport runways, pipelines, foundations for small buildings, ponds and small dams, irrigation projects, drainage systems, sewage and refuse disposal systems, and other engineering works. The ranges of values can be used to (1) select potential residential, commercial, industrial, and recreational uses; (2) make preliminary estimates pertinent to construction in a par-

ticular area; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for location of sanitary landfills, onsite sewage disposal systems, and other waste disposal facilities; (5) plan detailed onsite investigations of soils and geology; (6) find sources of gravel, sand, clay, and topsoil; (7) plan farm drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; (8) relate performance of structures already built to the properties of the kinds of soil on which they are built so that performance of similar structures on the same or a similar soil in other locations can be predicted; and (9) predict the trafficability of soils for cross-country movement of vehicles and construction equipment.

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

The information is presented mainly in tables. Table 13 shows, for each kind of soil, the degree and kind of limitations for building site development; table 14, for sanitary facilities; and table 16, for water management. Table 15 shows the suitability of each kind of soil as a source of construction materials.

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

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

Building site development

The degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, and local roads and streets are indicated in table 13. A *slight* limitation indicates that soil properties generally are favorable for the specified use; any limitation is minor and easily overcome. A *moderate* limitation indicates that soil properties and site features are unfavorable for the specified use, but the limitations can be overcome or minimized by special planning and design. A *severe* limitation indicates that one or more soil properties or site features are so unfavorable or difficult to overcome that a major increase in construction effort, special design, or intensive maintenance is required. For some soils rated severe, such costly measures may not be feasible.

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

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

Dwellings and *small commercial buildings* referred to in table 13 are built on undisturbed soil and have foundation loads of a dwelling no more than three stories high. Separate ratings are made for small commercial buildings without basements and for dwellings with and without basements. For such structures, soils should be sufficiently stable that cracking or subsidence of the structure from settling or shear failure of the foundation does not occur. These ratings were determined from estimates of the shear strength, compressibility, and shrink-swell potential of the soil. Soil texture, plasticity and in-place density, potential frost action, soil wetness, and depth to a seasonal high water table were also considered. Soil wetness and depth to a seasonal high water table indicate potential difficulty in providing adequate drainage for basements, lawns, and gardens. Depth to bedrock, slope, and large stones in or on the soil are also important considerations in the choice of sites for these structures and were considered in determining the ratings. Susceptibility to flooding is a serious hazard.

Local roads and streets referred to in table 13 have an all-weather surface that can carry light to medium traffic all year. They consist of a subgrade of the underlying soil material; a base of gravel, crushed rock fragments, or soil material stabilized with lime or cement; and a flexible or rigid surface, commonly asphalt or concrete. The roads are graded with soil material at hand, and most cuts and fills are less than 6 feet deep.

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

Sanitary facilities

Favorable soil properties and site features are needed for proper functioning of septic tank absorption fields, sewage lagoons, and sanitary landfills. The nature of the soil is important in selecting sites for these facilities and in identifying limiting soil properties and site features to be considered in design and installation. Also, those soil properties that affect ease of excavation or installation of these facilities will be of interest to contractors and local officials. Table 14 shows the degree and kind of limitations of each soil for such uses and for use of the soil as daily cover for landfills. It is important to observe local ordinances and regulations.

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

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

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

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

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

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons have a nearly level floor and cut slopes or embankments of compacted soil material. Aerobic lagoons generally are designed to hold sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water. Soils that are very high in content of organic matter and those that have cobbles, stones, or boulders are not suitable. Unless the soil has very slow permeability, contamination of ground water is a hazard where the seasonal high water table is above the level of the lagoon floor. In soils where the water table is seasonally high, seepage of ground water into the lagoon can seriously reduce the lagoon's capacity for liquid waste. Slope, depth to bedrock, and susceptibility to flooding also affect the suitability of sites for sewage lagoons or the cost of construction. Shear strength and permeability of compacted soil material affect the performance of embankments.

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

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

Unless otherwise stated, the limitations in table 14 apply only to the soil material within a depth of about 6 feet. If the trench is deeper, a limitation of slight or moderate may not be valid. Site investigation is needed before a site is selected.

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

The soils selected for final cover of landfills should be suitable for growing plants. Of all the horizons, the A horizon in most soils has the best workability, more organic matter, and the best potential for growing plants. Thus, for either the area- or trench-type landfill, stockpiling material from the A horizon for use as the surface layer of the final cover is desirable.

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

borrow areas. These factors include slope, erodibility, and potential for plant growth.

Construction materials

The suitability of each soil as a source of roadfill, sand, gravel, and topsoil is indicated in table 15 by ratings of good, fair, or poor. The texture, thickness, and organic-matter content of each soil horizon are important factors in rating soils for use as construction materials. Each soil is evaluated to the depth observed, generally about 6 feet.

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

The ratings apply to the soil material between the A horizon and a depth of 5 to 6 feet. It is assumed that soil horizons will be mixed during excavation and spreading. Many soils have horizons of contrasting suitability within their profile. The estimated engineering properties in table 19 provide specific information about the nature of each horizon. This information can help determine the suitability of each horizon for roadfill.

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

Sand and *gravel* are used in great quantities in many kinds of construction. The ratings in table 15 provide guidance as to where to look for probable sources and are based on the probability that soils in a given area contain sizable quantities of sand or gravel. A soil rated *good* or *fair* has a layer of suitable material at least 3 feet thick, the top of which is within a depth of 6 feet. Coarse fragments of soft bedrock material, such as shale and siltstone, are not considered to be sand and gravel. Fine-grained soils are not suitable sources of sand and gravel.

The ratings do not take into account depth to the water table or other factors that affect excavation of the material. Descriptions of grain size, kinds of minerals, reaction, and stratification are given in the soil series descriptions and in table 19.

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

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

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

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

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

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

Water management

Many soil properties and site features that affect water management practices have been identified in this soil survey. In table 16 soil and site features that affect use are indicated for each kind of soil. This information is significant in planning, installing, and maintaining water control structures.

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

Embankments, dikes, and levees require soil material that is resistant to seepage, erosion, and piping and has favorable stability, shrink-swell potential, shear strength, and compaction characteristics. Large stones and organic matter in a soil downgrade the suitability of a soil for use in embankments, dikes, and levees.

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

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

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

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

Recreation

Floyd Kelly, Jr., area engineer, Soil Conservation Service, helped to prepare this section.

The soils of the survey area are rated in table 17 according to limitations that affect their suitability for recreation uses. The ratings are based on such restrictive soil features as flooding, wetness, slope, and texture of the surface layer. Not considered in these ratings, but important in evaluating a site, are location and accessibility of the area, size and shape of the area and its scenic quality, the ability of the soil to support vegetation, access to water, potential water impoundment sites available, and either access to public sewerlines or capacity of the soil to absorb septic tank effluent. Soils subject to flooding are limited, in varying degree, for recreation use by the duration and intensity of flooding and the season when flooding occurs. Onsite assessment of height, duration, intensity, and frequency of flooding is essential in planning recreation facilities.

The degree of the limitation of the soils is expressed as slight, moderate, or severe. *Slight* means that the soil properties are generally favorable and that the limitations are minor and easily overcome. *Moderate* means that the limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 17 can be supplemented by information in other parts of this survey. Especially helpful are interpretations for septic tank absorption fields, given in table 14, and interpretations for dwellings without basements and for local roads and streets, given in table 13.

Camp areas require such site preparation as shaping and leveling for tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils for this use have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing camping sites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for use as picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that will increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones or boulders, is firm after rains, and is not dusty when dry. If shaping is required to obtain a uniform grade, the depth of the soil over bedrock or hardpan should be enough to allow necessary grading.

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

Wildlife habitat

John A. Dimas, wildlife biologist, Soil Conservation Service, helped to prepare this section.

Soils directly affect the kind and amount of vegetation that is available to wildlife as food and cover, and they affect the construction of water impoundments. The kind and abundance of wildlife that populate an area depend largely on the amount and distribution of food, cover, and water. If any one of these elements is missing, is inadequate, or is inaccessible, wildlife either are scarce or do not inhabit the area.

If the soils have the potential, wildlife habitat can be created or improved by planting appropriate vegetation,

by maintaining the existing plant cover, or by helping the natural establishment of desirable plants.

In table 18, the soils in the survey area are rated according to their potential to support the main kinds of wildlife habitat in the area. This information can be used in planning for parks, wildlife refuges, nature study areas, and other developments for wildlife; selecting areas that are suitable for wildlife; selecting soils that are suitable for creating, improving, or maintaining specific elements of wildlife habitat; and determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* means that the element of wildlife habitat or the kind of habitat is easily created, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected if the soil is used for the designated purpose. A rating of *fair* means that the element of wildlife habitat or kind of habitat can be created, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* means that limitations are severe for the designated element or kind of wildlife habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* means that restrictions for the element of wildlife habitat or kind of wildlife are very severe, and that unsatisfactory results can be expected. Wildlife habitat is impractical or even impossible to create, improve, or maintain on soils having such a rating.

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

Grain and seed crops are seed-producing annuals used by wildlife. The major soil properties that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, wheat, oats, and barley.

Grasses and legumes are domestic perennial grasses and herbaceous legumes that are planted for wildlife food and cover. Major soil properties that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are fescue, bluegrass, bromegrass, clover, and alfalfa.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds, that provide food and cover for wildlife. Major soil properties that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are galleta, Indian ricegrass, shadscale, rabbitbrush, greasewood, goldenrod, beggarweed, wheatgrass, and grama.

Coniferous plants are cone-bearing trees, shrubs, or ground cover plants that furnish habitat or supply food in the form of browse, seeds, or fruitlike cones. Soil properties that have a major effect on the growth of coniferous plants are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine, spruce, fir, pinyon, and juniper.

Shrubs are bushy woody plants that produce fruit, buds, twigs, bark, or foliage used by wildlife or that provide cover and shade for some species of wildlife. Major soil properties that affect the growth of shrubs are depth of the root zone, available water capacity, salinity, and moisture. Examples of shrubs are mountainmahogany, chokecherry, bitterbrush, Gambel oak, snowberry, and big sagebrush.

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

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

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

Openland habitat consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The kinds of wildlife attracted to these areas include Gambel quail, pheasant, meadowlark, field sparrow, killdeer, cottontail, red fox, and woodchuck.

Woodland habitat consists of areas of hardwoods or conifers, or a mixture of both, and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include wild turkey, band-tailed pigeon, ruffed grouse, woodpeckers, tree squirrels, gray fox, raccoon, mule deer, elk, and black bear.

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

Rangeland habitat consists of areas of wild herbaceous plants and shrubs. Wildlife attracted to rangeland

include antelope, desert mule deer, chukar, scaled quail, sage grouse, meadowlark, and lark bunting.

Soil properties

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

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

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

Engineering properties

Table 19 gives estimates of engineering properties and classifications for the major horizons of each soil in the survey area.

Most soils have, within the upper 5 or 6 feet, horizons of contrasting properties. Table 19 gives information for each of these contrasting horizons in a typical profile. *Depth* to the upper and lower boundaries of each horizon is indicated. More information about the range in depth and about other properties in each horizon is given for each soil series in the section "Soil series and morphology."

Texture is described in table 19 in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in soil material that is less than 2 millimeters in diameter. "Loam," for example, is soil material that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If a soil contains gravel or other particles coarser than sand, an appropriate modifier is added, for example, "gravelly loam." Other texture terms are defined in the Glossary.

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

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

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

When laboratory data are available, the A-1, A-2, and A-7 groups are further classified as follows: A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, and A-7-6. As an additional refinement, the desirability of soils as subgrade material can be indicated by a group index number. These numbers range from 0 for the best subgrade material to 20 or higher for the poorest. The estimated classification, without group index numbers, is given in table 19. Also in table 19 the percentage, by weight, of rock fragments more than 3 inches in diameter is estimated for each major horizon. These estimates are determined mainly by observing volume percentage in the field and then converting that, by formula, to weight percentage.

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

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

In some surveys, the estimates are rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount across classifi-

cation boundaries (1 or 2 percent), the classification in the marginal zone is omitted.

Physical and chemical properties

Table 20 shows estimated values for several soil characteristics and features that affect behavior of soils in engineering uses. These estimates are given for each major horizon, at the depths indicated, in the typical pedon of each soil. The estimates are based on field observations and on test data for these and similar soils.

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

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

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

Salinity is expressed as the electrical conductivity of the saturation extract, in millimhos per centimeter at 25 degrees C. Estimates are based on field and laboratory measurements at representative sites of the nonirrigated soils. The salinity of individual irrigated fields is affected by the quality of the irrigation water and by the frequency of water application. Hence, the salinity of individual fields can differ greatly from the value given in table 20. Salinity affects the suitability of a soil for crop production, its stability when used as a construction material, and its potential to corrode metal and concrete.

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

Risk of corrosion pertains to potential soil-induced chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to soil moisture, particle-size distribution, total acidity, and electrical conductivity of the soil material. The rate of corrosion of concrete is based mainly on the sulfate content, texture, and acidity of the soil. Protective measures for steel or more resistant concrete help to avoid or minimize damage resulting from the corrosion. Uncoated steel intersecting soil boundaries or soil horizons is more susceptible to corrosion than an installation that is entirely within one kind of soil or within one soil horizon.

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

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

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

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

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

4L. Calcareous loamy soils that are less than 35 percent clay and more than 5 percent finely divided calcium carbonate. These soils are erodible, but crops can be

grown if intensive measures to control soil blowing are used.

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

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

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

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

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

Soil and water features

Table 21 contains information helpful in planning land uses and engineering projects that are likely to be affected by soil and water features.

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

The four hydrologic soil groups are:

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

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

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

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

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

The generalized description of flood hazards is of value in land-use planning and provides a valid basis for land-use restrictions. The soil data are less specific, however, than those provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table is the highest level of a saturated zone more than 6 inches thick for a continuous period of more than 2 weeks during most years. The depth to a seasonal high water table applies to undrained soils. Estimates are based mainly on the relationship between grayish colors or mottles in the soil and the depth to free water observed in many borings made during the course of the soil survey. Indicated in table 21 are the depth to the seasonal high water table; the kind of water table, that is, perched, artesian, or apparent; and the months of the year that the water table commonly is high. Only saturated zones above a depth of 5 or 6 feet are indicated.

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

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

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

Classification of the soils

The system of soil classification currently used was adopted by the National Cooperative Soil Survey in 1965. Readers interested in further details about the system should refer to "Soil taxonomy" (*4*).

The system of classification has six categories. Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. In this system the classification is based on the different soil properties that can be observed in the field or those that can be inferred either from other properties that are observable in the field or from the combined data of soil science and other disciplines. The properties selected for the higher categories are the result of soil genesis or of factors that affect soil genesis. In table 22, the soils of the survey area are classified according to the system. Categories of the system are discussed in the following paragraphs.

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

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

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of expression of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and a prefix that suggests something about the properties of the soil. An example is Haplaquents (*Hapl*, meaning simple horizons, plus *aquent*, the suborder of Entisols that have an aquic moisture regime).

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

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

SERIES. The series consists of soils that formed in a particular kind of material and have horizons that, except for texture of the surface soil or of the underlying substratum, are similar in differentiating characteristics and in arrangement in the soil profile. Among these characteristics are color, texture, structure, reaction, consistence, and mineral and chemical composition.

Soil series and morphology

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

Characteristics of the soil and the material in which it formed are discussed for each series. The soil is then compared to similar soils and to nearby soils of other series. Then a pedon, a small three-dimensional area of soil that is typical of the soil series in the survey area, is described. The detailed descriptions of each soil horizon follow standards in the Soil Survey Manual (*3*). Unless otherwise noted, colors described are for moist soil.

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

Absarokee series

The Absarokee series consists of moderately deep, well drained soils that formed in material that was weathered from sandstone and interbedded shale. Absarokee soils are on uplands and valley side slopes. Slopes range from 3 to 60 percent. Average annual precipitation

is 15 to 20 inches, and average annual air temperature is about 44 degrees F.

Absarokee soils are similar to Delson, Cerro, and Work soils and are near Beenom, Radersburg, and Fughes soils. Delson and Work soils are more than 40 inches deep. Delson soils are noncalcareous in the C horizon. Beenom soils have sandstone bedrock at a depth of less than 20 inches. Radersburg soils have more than 35 percent rock fragments in the B horizon. Fughes soils are more than 40 inches deep and have a dark colored A horizon that is more than 16 inches thick.

Typical pedon of Absarokee loam, in an area of Absarokee-Work loams, 6 to 25 percent slopes, in Poison Spring Gulch, NW1/4 Sec. 27, T. 50 N., R. 7 W., in Montrose County:

A1—0 to 7 inches; dark grayish brown (10YR 4/2) loam, very dark brown (10YR 2/2) moist; moderate medium granular structure; soft, very friable, slightly sticky and slightly plastic; 5 percent angular sandstone fragments; neutral; clear wavy boundary. (4 to 10 inches thick)

B1—7 to 13 inches; grayish brown (10YR 5/2) clay loam, very dark grayish brown (10YR 3/2) moist; weak medium and fine subangular blocky structure; hard, friable, 5 percent angular sandstone fragments; thin patchy clay films; neutral; clear wavy boundary. (4 to 8 inches thick)

B21t—13 to 17 inches; brown (7.5YR 5/4) clay, dark brown (7.5YR 4/4) moist; moderate and fine medium subangular blocky structure; very hard, firm, sticky and plastic; 5 percent sandstone fragments; moderate continuous clay films; neutral; clear wavy boundary. (2 to 6 inches thick)

B22t—17 to 25 inches; brown (7.5YR 5/4) clay, dark brown (7.5YR 4/4) moist; moderate coarse angular and subangular blocky structure; very hard, firm, sticky and plastic; 5 percent sandstone fragments; moderate continuous clay films; mildly alkaline; gradual wavy boundary. (6 to 10 inches thick)

Cca—25 to 30 inches; light brown (7.5YR 6/4) channery clay loam, brown (7.5YR 5/4) moist; massive; hard, friable, slightly sticky and plastic; 20 percent sandstone fragments; calcareous; visible secondary lime well disseminated throughout horizon; moderately alkaline; abrupt wavy boundary. (4 to 6 inches thick)

R—30 inches; fractured calcareous sandstone bedrock.

The A horizon has value of 4 or 5 dry and 2 or 3 moist and has chroma of 2 or 3 moist and dry. The B horizon has hue of 7.5YR or 10YR, value of 5 or 6 dry and 3 or 4 moist, and chroma of 3 or 4 moist and dry. This horizon is clay loam or clay, and clay content ranges from 35 to 50 percent. Texture of the fine earth fraction in the C horizon ranges from loam to clay loam. The content of rock fragments ranges from 20 to 30 percent in the C horizon. The C horizon is calcareous throughout.

Agua Fria series

The Agua Fria series consists of deep, well drained soils that formed in stony outwash alluvium that was weathered from igneous rock. Agua Fria soils are on high terraces, mesas, and fans. Slopes range from 1 to 50 percent. Average annual precipitation is about 13 inches, and average annual air temperature is about 47 degrees F.

Agua Fria soils are similar to Scholle, Potts, and Absarokee soils and are near Saraton, Ascalon, Colona, and Razor soils. Scholle and Potts soils have less than 35 percent clay in the B horizon. Absarokee soils have less than 35 percent clay in the B horizon and have sandstone bedrock at a depth of 20 to 40 inches. Saraton soils have marl at a depth of 20 to 40 inches. Ascalon soils have a dark colored sandy loam surface layer. Colona soils have a silty clay loam A horizon and a silty clay B horizon. Razor soils have a silty clay loam A horizon and a B horizon that has shale bedrock at a depth of 20 to 40 inches.

Typical pedon of Agua Fria stony loam, 3 to 12 percent slopes, NE1/4 Sec. 16, T. 14 S., R. 93 W., in Delta County:

A1—0 to 2 inches; brown (7.5YR 5/3) stony loam, dark brown (7.5YR 4/3) moist; moderate fine granular structure; soft, friable, slightly sticky and slightly plastic; many medium and fine roots; 5 percent stone; moderately alkaline; clear smooth boundary. (1 to 3 inches thick)

B1—2 to 5 inches; brown (7.5YR 5/2) stony clay loam, dark brown (7.5YR 4/2) moist; weak fine subangular blocky structure that parts to moderate very fine subangular blocky structure; hard, friable, slightly sticky and slightly plastic; many medium and fine roots; 5 percent stone; moderately alkaline; clear smooth boundary. (2 to 4 inches thick)

B2t—5 to 14 inches; reddish brown (5YR 5/4) stony clay loam, reddish brown (5YR 4/4) moist; moderate medium and fine angular blocky structure; hard to very hard, firm, very sticky and plastic; moderately thick continuous clay films on faces of peds; many medium and coarse roots; 10 percent stone, 5 percent gravel; moderately alkaline; gradual wavy boundary. (7 to 12 inches thick)

B3ca—14 to 24 inches; light brown (7.5YR 6/4) stony clay loam, brown (7.5YR 5/4) moist; moderate medium subangular blocky structure; very hard, friable, sticky and plastic; common thin to moderately thick clay films on faces of peds; few medium and coarse roots; 10 percent stones, 5 percent gravel, 5 percent cobbles; visible secondary carbonate occurring as soft masses and thin seams; calcareous; moderately alkaline; gradual smooth boundary. (8 to 11 inches thick)

C1ca—24 to 34 inches; pink (7.5YR 7/4) cobbly loam, brown (7.5YR 5/4) moist; massive; hard, friable,

slightly sticky and slightly plastic; 20 percent gravel, 10 percent cobble, 10 percent stone; well disseminated, visible secondary calcium carbonate; calcareous; moderately alkaline; gradual wavy boundary. (8 to 12 inches thick)

C2ca—34 to 60 inches; pink (7.5YR 7/4) very cobbly loam, light brown (7.5YR 6/4) moist; massive; very hard, friable, slightly sticky and slightly plastic; 25 percent cobble, 20 percent gravel, 10 percent stones; well disseminated, visible secondary calcium carbonate; calcareous; moderately alkaline.

Thickness of the solum is 15 to 30 inches. Reaction is moderately alkaline to strongly alkaline. The A horizon has value of 5 or 6 dry and 3 to 5 moist and has chroma of 3 or 4 moist and dry. Texture is stony loam or clay loam. The B horizon has hue of 7.5YR or 5YR, value of 4 or 5 dry and 3 or 4 moist, and chroma of 3.5 to 4 moist and dry. It is heavy clay loam or clay, and clay content ranges from 35 to 45 percent. The content of rock fragments ranges from 5 to 30 percent. Texture of the C horizon is cobbly, very cobbly, stony, or very stony loam.

Apishapa series

The Apishapa series consists of deep, poorly to somewhat poorly drained soils that formed in recent alluvium that was weathered from shale. Apishapa soils are on flood plains, low terraces, and alluvial fans. Slopes range from 0 to 5 percent. Average annual precipitation is about 12 inches, and average annual air temperature is about 48 degrees F. A water table is at or near the surface during some period of the year unless the soils are artificially drained.

Apishapa soils are similar to Colona, Limon, and Razor soils and are near Kech, Progresso, Potts, and Scholle soils. Colona and Limon soils do not have mottles in the profile. Razor soils do not have mottles, but they have shale at a depth of 20 to 40 inches. Kech, Potts, and Progresso soils have a loam A horizon and a clay loam B horizon. Kech soils have sandstone bedrock at a depth of less than 20 inches. Progresso soils have sandstone bedrock at a depth of 20 to 40 inches, and Potts soils are more than 40 inches over bedrock. Scholle soils have a stony loam A horizon and a gravelly clay loam B horizon.

Typical pedon of Apishapa silty clay loam, 0 to 5 percent slopes, NW1/4 Sec. 24, T. 5 N., R. 7 W., in Delta County:

A11—0 to 3 inches; light olive gray (5Y 6/2) silty clay loam, olive gray (5Y 4/2) moist; moderate very fine granular structure; slightly hard, friable, sticky and plastic; calcareous; mildly alkaline; clear smooth boundary. (2 to 4 inches thick)

A12—3 to 9 inches; light olive gray (5Y 6/2) silty clay, olive gray (5Y 4/2) moist; weak medium subangular blocky structure that parts to moderate medium granular; hard, friable, very sticky and very plastic; calcareous; mildly alkaline; gradual wavy boundary. (2 to 6 inches thick)

AC—9 to 23 inches; grayish brown (2.5Y 5/3) heavy silty clay loam, dark grayish brown (2.5Y 4/2) moist; common fine distinct brown and yellowish brown mottles; weak fine subangular blocky structure; very hard, firm, very sticky and very plastic; cracks up to 1/2 inch wide; few slickensides; calcareous; moderately alkaline; gradual smooth boundary. (8 to 16 inches thick)

C1cacsg—23 to 35 inches; dark gray (N 4/) heavy silty clay loam, very dark gray (N 3/) moist; common, prominent yellowish brown and strong brown mottles; massive; very hard, firm, sticky and plastic; visible gypsum in thin seams; calcareous; moderately alkaline; gradual smooth boundary. (10 to 14 inches thick)

C2cacsg—35 to 60 inches; dark gray (N 4/) heavy silty clay loam, very dark gray (N 3/) moist; many prominent yellowish brown and strong brown mottles; massive; hard, firm, sticky and plastic; visible gypsum in thin seams; calcareous; moderately alkaline.

The A horizon has value of 5 or 6 dry and 4 or 5 moist and has chroma of 1.5 to 3 moist and dry. The control section has hue of 2.5Y or 5Y, value of 5 or 6 dry and 4 or 5 moist, and chroma of 1 or 2 moist and dry. Mottles extend to the base of the epipedon and range from faint to prominent. The control section is silty clay loam or silty clay, and clay content ranges from 35 to 42 percent. Cracks up to 1/2 inch wide, and slickensides are common. Visible gypsum and carbonates are in thin seams and streaks.

Ascalon series

The Ascalon series consists of deep, well drained soils that formed in material that was weathered from sandstone. Ascalon soils are on uplands, valley side slopes, and fans. Slopes range from 3 to 10 percent. Average annual precipitation is 15 to 20 inches, and average annual air temperature is about 52 degrees F.

Ascalon soils are similar to Potts and Progresso soils and are near Mesa, Agua Fria, and Saraton soils. Mesa, Potts, and Progresso soils have a thin, light colored A horizon. Progresso soils have sandstone bedrock at a depth of 20 to 40 inches. Agua Fria soils have a thin, light colored A horizon and more than 35 percent clay in the B horizon. Saraton soils have marl at a depth of 20 to 40 inches.

Typical pedon of Ascalon sandy loam, 3 to 10 percent slopes, in an orchard, .33 miles west and .15 miles south of the center of Sec. 6, T. 13 S., R. 94 W., in Delta County:

Ap—0 to 8 inches; grayish brown (10YR 5/2) sandy loam, very dark grayish brown (10YR 3/2) moist; moderate medium granular structure; slightly hard, friable; neutral; clear smooth boundary. (4 to 10 inches thick)

B21t—8 to 16 inches; brown (10YR 5/3) sandy clay loam, dark brown (10YR 3/3) moist; moderate fine subangular blocky structure; hard, friable, slightly sticky and slightly plastic; thin patchy clay films on peds; neutral; clear gradual boundary. (3 to 10 inches thick)

B22t—16 to 34 inches; light yellowish brown (2.5Y 6/4) sandy clay loam, light olive brown (2.5Y 5/4) moist; moderate medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; thin patchy clay films on ped surfaces; neutral; clear gradual boundary. (8 to 20 inches thick)

B3ca—34 to 40 inches; pale yellow (2.5Y 7/4) sandy loam, light olive brown (2.5Y 5/4) moist; weak subangular blocky structure; slightly hard, friable, calcareous; mildly alkaline; clear gradual boundary. (5 to 10 inches thick)

Cca—40 to 60 inches; pale yellow (2.5Y 7/4) sandy loam, light olive brown (2.5Y 5/4) moist; weak medium subangular blocky structure; slightly hard, very friable; calcareous; mildly alkaline; medium sized lime concretions common.

The mollic epipedon ranges from 7 to 18 inches thick. The content of angular, gravel and cobble sized fragments ranges from 0 to 10 percent in the mollic epipedon. The A horizon has value of 4 to 5 dry and 2 to 3 moist and has chroma of 2 or 3 moist and dry. This horizon is commonly sandy loam but ranges to light sandy clay loam. The B horizon has hue of 7.5YR to 2.5Y, value of 2 to 5 moist and 4 to 6 dry, and chroma of 3 to 4 moist and dry. The B horizon is typically sandy clay loam but averages 18 to 27 percent clay. Texture in the C horizon ranges from sandy loam to fine sandy loam. The content of angular, gravel and cobble size fragments ranges up to 15 percent in the C horizon.

Avalon series

The Avalon series consists of deep, well drained soils that formed in eolian material that was reworked with basaltic alluvium. Avalon soils are on terraces, mesas, and valley foot slopes. Slopes range from 0 to 6 percent. Average annual precipitation is about 10 inches, and average annual air temperature is about 50 degrees F.

Avalon soils are similar to Utaline and Saraton soils and are near Mesa, Ascalon, and Billings soils. Utaline soils have more than 35 percent basaltic rock fragments in the underlying layers. Saraton soils have marl at a depth of 20 to 40 inches. Mesa and Ascalon soils have an increase of clay content in the B horizon. Ascalon soils have a mollic epipedon. Billings soils have a silty clay loam A horizon and AC horizon and are stratified in the lower part of the profile.

Typical pedon of Avalon loam, 3 to 6 percent slopes, SE1/4 Sec. 13, T. 14 S., R. 95 W., in Delta County:

Ap—0 to 9 inches; light brown (7.5YR 6/4) loam, dark brown (7.5YR 4/4) moist; weak medium subangular blocky structure that parts to weak fine granular; slightly hard, friable, slightly sticky and slightly plastic; calcareous; mildly alkaline; clear wavy boundary. (6 to 11 inches thick)

B2—9 to 16 inches; pink (7.5YR 7/4) loam, light brown (7.5YR 6/4) moist; weak coarse subangular blocky structure that parts to weak medium subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; calcareous; mildly alkaline; clear wavy boundary. (4 to 10 inches thick)

Cca—16 to 26 inches; light brown (7.5YR 6/4) loam, brown (7.5YR 5/4) moist; massive; hard, friable, slightly sticky and slightly plastic; visible lime in thin seams and small concretions; calcareous; mildly alkaline; clear smooth boundary. (8 to 14 inches thick)

C2ca—26 to 60 inches; pink (7.5YR 8/4) loam, pink (7.5YR 7/4) moist; massive; hard, friable, sticky and plastic; 10 percent gravel content which increases with depth; lime well disseminated; calcareous; moderately alkaline.

The ochric epipedon ranges from 6 to 11 inches thick. The content of gravel and cobble size fragments ranges from 0 to 10 percent. The Ap horizon has value of 5 or 6 dry and 4 or 5 moist and has chroma of 2 to 4 moist and dry. The C horizon has hue of 7.5YR or 10YR, value of 5 to 7 moist and 6 to 8 dry, and chroma of 3 or 4 moist and dry. The content of carbonates ranges from 15 to 40 percent in the C horizon, and the content of gravel and cobble ranges from 0 to 20 percent. Reaction is mildly alkaline or moderately alkaline.

Beenom series

The Beenom series consists of shallow, well drained soils that formed in place from sandstone and interbedded shale. Beenom soils are on uplands and mountain side slopes. Slopes range from 5 to 60 percent. Average annual precipitation is about 17 inches, and average annual air temperature is about 43 degrees F.

Beenom soils are similar to Absarokee, Work, and Curecanti soils and are near Radersburg, Cerro, Delson, and Fughes soils. Absarokee soils have bedrock at a depth of 20 to 40 inches. Work, Curecanti, Radersburg, Cerro, Delson, and Fughes soils are deep and have more than 35 percent clay in the B horizon. Radersburg and Curecanti soils have more than 35 percent rock fragments in the B horizon. Delson and Fughes soils are noncalcareous in the C horizon.

Typical pedon of Beenom loam, in an area of Beenom-Absarokee loams, 5 to 20 percent slopes, on

north rim of Black Canyon, near center Sec. 19, T. 50 N., R. 6 W., in Montrose County:

A1—0 to 4 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; moderate medium granular structure; soft, friable, slightly sticky and slightly plastic; neutral; clear smooth boundary. (2 to 6 inches thick)

B2t—4 to 9 inches; dark brown (7.5YR 4/2) clay loam, dark brown (7.5YR 3/2) moist; moderate medium subangular blocky structure that parts to moderate fine subangular blocky; hard, friable, sticky and plastic; thin continuous clay films; mildly alkaline; clear wavy boundary. (4 to 10 inches thick)

C—9 to 14 inches; very pale brown (10YR 7/4) channery loam, yellowish brown (10YR 5/4) moist; massive; hard, friable, slightly sticky and slightly plastic; 30 percent sandstone channery; mildly alkaline; gradual smooth boundary. (0 to 6 inches thick)

R—14 inches; slightly weathered calcareous sandstone or interbedded sandstone and shale.

The mollic epipedon ranges from 8 to 12 inches thick. The content of angular, gravel size fragments ranges from 0 to 15 percent.

The A horizon has value of 4 or 5 dry and 2 or 3 moist and has chroma of 2 or 3 moist and dry. The Bt horizon has hue of 7.5YR or 10YR, value of 4 or 5 dry and 3 or 4 moist, and chroma of 2 or 3 moist and dry. Clay content ranges from 27 to 35 percent. The content of flat, gravel fragments ranges up to 15 percent. Texture of the fine earth fraction in the C horizon ranges from loam to clay loam. The content of sandstone fragments ranges from 15 to 35 percent in the C horizon. Weathered sandstone is at a depth of 10 to 20 inches.

Billings series

The Billings series consists of deep, well drained soils that formed in alluvium from silty calcareous shale. Billings soils are on alluvial fans and flood plains. Slopes range from 0 to 6 percent. Average annual precipitation is about 10 inches, and average annual air temperature is about 50 degrees F.

Billings soils are similar to Glenton soils and are near Killpack, Chipeta, Persayo, and Cliffdown soils. Glenton soils have a fine sandy loam A and C horizon. Killpack soils have shale bedrock at a depth of 20 to 40 inches. Chipeta and Persayo soils have shale bedrock at a depth of less than 20 inches. Chipeta soils have a silty clay A horizon and C horizon. Cliffdown soils are gravelly and have more than 35 percent rock fragments in the control section.

Typical pedon of Billings silty clay loam, in an area of Billings silty clay loam, gullied, 0 to 6 percent slopes, NE1/4NE1/4 Sec. 27, T. 4 S., R. 3 E., (Ute PM), in Delta County:

A1—0 to 4 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; weak fine platy structure; slightly hard, friable, sticky and plastic; calcareous; moderately alkaline; gradual smooth boundary. (2 to 6 inches thick)

AC—4 to 16 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; weak fine subangular blocky structure; hard, firm, very sticky and very plastic; calcareous; moderately alkaline; gradual wavy boundary. (10 to 14 inches thick)

C—16 to 60 inches; light brownish gray (2.5Y 6/2) stratified clay loam and silty clay loam, dark grayish brown (2.5Y 4/2) moist; massive; hard, firm, very sticky and very plastic; few roots; few very fine pores; small gypsum crystals; fine inconsistant seams of calcium carbonates; calcareous; moderately alkaline.

The A horizon has value of 5 to 7 dry and 4 to 6 moist and has chroma of 2 or 3 moist and dry. The C horizon has hue of 5Y or 2.5Y, value of 6 to 8 dry and 4 to 6 moist, and chroma of 2 or 3 moist and dry. This horizon may be stratified. Texture is silty loam, clay loam, or silty clay loam. Clay content ranges from 27 to 35 in the C horizon, shale chips range from 0 to 10 percent, and carbonates range from 5 to 15 percent.

Breece series

The Breece series consists of deep, well drained soils that formed in alluvial material from mixed origin. Breece soils are on alluvial fans, flood plains, and low terraces. Slopes range from 1 to 6 percent. Average annual precipitation is about 20 inches, and average annual air temperature is about 40 degrees F. These soils have a water table during spring snowmelt or when irrigation water is applied.

Breece soils are similar to Fughes soils and are near Bulkley, Curecanti, and Cochetopa soils. Fughes, Bulkley, and Cochetopa soils have more than 35 percent clay in the B horizon. Bulkley soils have a thin, light colored A horizon. Curecanti soils have more than 35 percent rock fragments in the B horizon. Cochetopa soils have a colder soil temperature and air temperature.

Typical pedon of Breece loam, 1 to 6 percent slopes, McIntire Ranch, Muddy Creek; SE1/4SW1/4 Sec. 11, T. 11 S., R. 90 W., in Gunnison County:

A1—0 to 19 inches; dark brown (10YR 4/3) loam, dark brown (10YR 3/3) moist; weak fine subangular blocky and granular structure; slightly hard, friable, slightly sticky and slightly plastic; neutral (pH 6.8); clear smooth boundary. (18 to 24 inches thick)

AC—19 to 30 inches; pale brown (10YR 6/3) sandy loam, dark brown (10YR 4/3) moist; weak medium fine subangular blocky structure; slightly hard, fri-

able; neutral; clear smooth boundary. (8 to 15 inches thick)

C—30 to 60 inches; pale brown (10YR 6/3) sandy loam, dark brown (10YR 4/3) moist; few fine faint yellowish brown mottles; massive; slightly hard, friable; 5 percent gravel; neutral.

The mollic epipedon ranges from 18 to 24 inches thick. The A1 horizon has value of 4 and 5 dry and 2 and 3 moist and has chroma of 2 or 3 moist and dry. The control section has hue of 7.5YR or 10YR, value of 4 to 6 dry and 3 or 4 moist, and chroma of 2 or 3 moist and dry. Mottles may be within 12 inches of the epipedon and range from faint to prominent. The C horizon below the control section is stratified with sand, gravel, or cobble in some pedons.

Bulkley series

The Bulkley series consists of deep, well drained soils that formed in shale and interbedded sandstone. Bulkley soils are on mountain slopes and uplands. Slopes range from 12 to 65 percent. Average annual precipitation is about 18 inches, and average air temperature is about 37 degrees F.

Bulkley soils are similar to Colona and Razor soils and near Fughes, Curecanti, and Breece soils. Colona and Razor soils are calcareous to the surface. Razor soils have silty calcareous shale at a depth of 20 to 40 inches. Fughes, Curecanti, and Breece soils have a dark colored surface layer. Curecanti soils have less than 35 percent rock fragments. Breece soils have a loam A horizon over sandy loam.

Typical pedon of Bulkley clay loam, 12 to 25 percent slopes, SW1/4 Sec. 35, T. 11 S., R. 90 W., in Gunnison County:

A1—0 to 3 inches; grayish brown (10YR 5/2) clay loam, dark grayish brown (10YR 4/2) moist; moderate medium and fine granular structure; hard, firm, sticky and plastic; few fine roots; neutral; clear smooth boundary. (2 to 4 inches thick)

B2—3 to 27 inches; grayish brown (10YR 5/2) clay, dark brown (10YR 4/3) moist; moderate medium subangular blocky structure; extremely hard, very firm, sticky and plastic; few fine roots; cracks up to 1/2 inch; neutral; gradual smooth boundary. (18 to 30 inches thick)

B31ca—27 to 35 inches; light brownish gray (10YR 6/2) clay, grayish brown (10YR 5/2) moist; moderate medium subangular blocky structure; very hard, firm, sticky and plastic; few very fine roots; cracks up to 1/2 inch; well disseminated visible secondary level; calcareous; mildly alkaline; gradual smooth boundary. (6 to 10 inches thick)

B32ca—35 to 45 inches; light brownish gray (10YR 6/2) silty clay loam, brown (10YR 5/3) moist; moderate medium and fine subangular blocky structure; very hard, firm, sticky and plastic; few very fine roots; well disseminated visible secondary level; calcareous; moderately alkaline; gradual smooth boundary. (8 to 12 inches thick)

C1ca—45 to 60 inches; pale brown (10YR 6/3) silty clay loam, brown (10YR 5/3) moist; weak medium and fine subangular blocky structure; hard, firm, slightly sticky and plastic; 20 percent shale chips; well disseminated visible secondary level; calcareous; moderately alkaline. (6 to 18 inches thick)

C2—60 inches; broken weathered shale.

The soils are neutral to moderately alkaline in the A and B horizon. The A horizon has value of 4 to 6 dry and 4 or 5 moist and has chroma of 2 to 4 moist and dry. The B2 horizon has hue of 5Y to 10YR, value of 4 to 6 dry and 4 or 5 moist, and chroma of 2 to 4 moist and dry. Texture is typically clay or silty clay ranging to silty clay loam. Clay content ranges from 35 to 50 percent of the B2 horizon. Cracks up to 1/2 inch wide and slickensides are common. Few gypsum crystals appear in thin seams in some pedons. Texture of the C horizon is silty clay loam or silty clay. Weathered shale is at a depth of 40 to 70 inches.

Cerro series

The Cerro series consists of deep, well drained soils that formed in old landslide deposits and glacial outwash from igneous origin. Cerro soils are on alluvial fans, terraces, and mountain slopes. Slopes range from 1 to 35 percent. Average annual precipitation is about 12 to 16 inches, and average annual air temperature is about 44 degrees F.

Cerro soils are similar to Delson and Radersburg soils and are near Fughes, Absarokee, and Work soils. Delson and Fughes soils are noncalcareous in the substrata. Fughes soils have a mollic epipedon more than 16 inches thick. Absarokee soils have sandstone bedrock at a depth of 20 to 40 inches. Work soils do not have a high COLE value or deep wide cracks.

Typical pedon of Cerro loam, 6 to 12 percent slopes, 100 feet east of the S1/4 corner of Sec. 33, T. 15 S., R. 91 W., in Delta County:

A1—0 to 6 inches; brown (7.5YR 5/2) loam, dark brown (7.5YR 3/2) moist; moderate medium granular structure that parts to moderate fine granular; slightly hard, very friable, slightly sticky and slightly plastic; neutral; clear smooth boundary. (4 to 8 inches thick)

B1—6 to 11 inches; reddish brown (5YR 5/3) clay loam, dark reddish brown (5YR 3/3) moist; moderate medium subangular structure that parts to moderate very fine subangular blocky; hard, friable, sticky and plastic; thin patchy clay films; neutral; clear smooth boundary. (4 to 6 inches thick)

B21t—11 to 19 inches; reddish brown (5YR 5/3) clay, reddish brown (5YR 4/3) moist; weak medium pris-

matic structure parting to strong medium subangular and angular blocky; extremely hard, very firm, very sticky and very plastic; gravel 5 percent; moderate continuous clay films; crack, slickensides; neutral; clear smooth boundary. (6 to 12 inches thick)

B22t—19 to 26 inches; reddish brown (5YR 5/4) heavy clay loam, reddish brown (5YR 4/4) moist; weak medium prismatic structure that parts to moderate medium subangular blocky; extremely hard, very firm, very sticky and very plastic; gravel 5 percent; moderate continuous clay films; crack, slickensides; mildly alkaline; clear smooth boundary. (4 to 10 inches thick)

B3ca—26 to 31 inches; pink (5YR 7/4) clay loam, reddish brown (5YR 5/4) moist; moderate medium and fine subangular blocky structure; thin patchy clay films on peds; calcareous with many fine lime nodules; moderately alkaline; gradual smooth boundary. (4 to 9 inches thick)

Cca—31 to 60 inches; pink (7.5YR 7/4) gravelly clay loam, light brown (7.5YR 6/4) moist; weak medium subangular blocky structure; hard, friable, sticky and plastic; less than 35 percent rock fragments to 40 inches; calcareous; moderately alkaline.

The mollic epipedon ranges from 7 to 14 inches thick. The solum ranges from 20 to 36 inches thick. Wide cracks up to 1/2 inch are in dry soils. Slickensides are common.

The A horizon has value of 4 or 5 dry and 2 or 3 moist and has chroma of 2 or 3. The B horizon has hue of 5YR or 7.5YR, value of 5 or 6 dry and 3 or 4 moist, and chroma of 3 or 4 moist and dry. The content of rock fragments ranges from 0 to 15 percent in the B horizon. Texture of the fine earth fraction in the C horizon ranges from clay loam to clay. The content of gravel and cobble in the C horizon is less than 35 percent at a depth of less than 40 inches.

Chipeta series

The Chipeta series consists of shallow, well drained soils that formed in place from silty calcareous shale. Chipeta soils are on uplands. Slopes range from 3 to 30 percent. Average annual precipitation is about 9 inches, and average annual air temperature is about 50 degrees F.

Chipeta soils are similar to Persayo and Killpack soils and are near Lazear, Shavano, and Cliffdown soils. Persayo and Killpack soils are clay loam throughout. Killpack soils have silty calcareous shale at a depth of 10 to 20 inches. Lazear soils have hard sandstone bedrock at a depth of less than 30 inches. Shavano soils have hard sandstone bedrock at a depth of 20 to 40 inches. Cliffdown soils have more than 35 percent rock fragments in the C horizon.

Typical pedon of Chipeta silty clay, 3 to 30 percent slopes, NE1/4NE1/4 Sec. 20, T. 14 S., R. 95 W., in Delta County:

A1—0 to 4 inches; light brownish gray (2.5Y 6/2) silty clay, dark grayish brown (2.5Y 4/2) moist; moderate medium granular structure; slightly hard, firm, sticky and plastic; calcareous; mildly alkaline; clear wavy boundary. (3 to 6 inches thick)

C1cs—4 to 15 inches; light brownish gray (2.5Y 6/2) silty clay, dark grayish brown (2.5Y 4/2) moist; weak subangular blocky structure that parts to moderate fine angular blocky; hard, firm, very sticky and very plastic; few to many fine gypsum crystals; 20 percent soft shale fragments; calcareous; moderately alkaline; gradual wavy boundary. (7 to 14 inches thick)

C2r—15 inches; partially weathered olive gray saline shale.

The epipedon ranges from 3 to 6 inches thick. Partially weathered, olive gray saline shale is at a depth of less than 20 inches. The soils are calcareous throughout.

The A horizon has value of 5 to 7 dry and 4 to 6 moist and has chroma of 1 or 2 moist and dry. The C horizon has hue of 2.5Y or 5Y, value of 5 to 6 dry and 4 to 5 moist, and chroma of 1 or 2 moist and dry. The content of gypsum crystals does not exceed 10 percent in some areas of the C horizon.

Cliffdown series

The Cliffdown series consists of deep, well drained soils that formed in gravelly and cobbly alluvium from varied origin. Cliffdown soils are on terraces and outwash fans. Slopes range from 0 to 12 percent. Average annual precipitation is about 9 inches, and average annual air temperature is about 51 degrees F.

Cliffdown soils are similar to Glenton and Billings soils and are near Lazear, Shavano, Persayo, and Killpack soils. Glenton and Billings soils have less than 35 percent rock fragments in the C horizon and are stratified in the lower part of the profile. Lazear soils have hard sandstone bedrock at a depth of less than 20 inches. Shavano soils have hard sandstone bedrock at a depth of less than 20 to 40 inches. Persayo soils have soft calcareous shale at a depth of less than 20 inches, and Killpack soils have soft calcareous shale at a depth of 20 to 40 inches.

Typical pedon of Cliffdown gravelly loam, 0 to 12 percent slopes, SW1/4 Sec. 34, T. 4 S., R. 3 E., (Ute PM), in Delta County:

A1—0 to 4 inches; pale brown (10YR 6/3) gravelly loam, brown (10YR 5/3) moist; moderate very fine granular structure; soft, very friable; 15 percent gravel; calcareous; mildly alkaline; clear smooth boundary. (3 to 7 inches thick)

AC—4 to 9 inches; pale brown (10YR 6/3) gravelly loam, brown (10YR 5/3) moist; weak very fine granular structure; soft, very friable; 30 percent gravel; calcareous; mildly alkaline; clear smooth boundary. (4 to 8 inches thick)

C1ca—9 to 20 inches; white (10YR 8/2) extremely gravelly sandy loam, grayish brown (10YR 5/2) moist; massive; slightly indurated; lime concretions on some gravels, mainly on the lower sides; 70 percent gravel; calcareous; moderately alkaline; clear wavy boundary. (9 to 13 inches thick)

C2—20 to 60 inches; white (10YR 8/2) extremely gravelly heavy loamy sand, light brownish gray (10YR 6/2) moist; massive; slightly hard, very friable; 80 percent gravel; calcareous but with less lime than horizon above; moderately alkaline.

The ochric epipedon ranges from 3 to 7 inches thick, and the content of rock fragments ranges from 10 to 20 percent. The A horizon has value of 5 or 6 dry and 4 or 5 moist and has chroma of 2 to 4 moist and dry. The control section (10 to 40 inches) has hue of 7.5YR or 10YR, value of 6 to 8 dry and 5 to 7 moist, and chroma of 2 or 3 moist and dry. The content of rock fragments ranges from 40 to 80 percent of the control section. Reaction is mildly alkaline or moderately alkaline.

Cochetopa series

The Cochetopa series consists of deep, well drained soils that formed in old landslide deposits and outwash alluvium from materials of igneous origin. Cochetopa soils are on mountain side slopes and fans. Slopes range from 10 to 40 percent. Average annual precipitation is about 22 inches, and average annual air temperature is about 39 degrees F.

Cochetopa soils are similar to Northwater soils and are near Delson, Fughes, Cerro, and Work soils. Northwater soils have more than 35 percent rock fragments in the B horizon. Delson, Fughes, Cerro, and Work soils have an average summer soil temperature greater than 59 degrees F. Cerro and Work soils are calcareous in the C horizon.

Typical pedon of Cochetopa stony loam, 10 to 40 percent slopes, NE1/4NE1/4 Sec. 19, T. 12 S., R. 94 W., in Delta County:

A11—0 to 9 inches; dark gray (10YR 4/1) stony loam, black (10YR 2/1) moist; moderate medium granular structure; soft, friable, slightly sticky and slightly plastic; 10 percent stone; neutral; gradual wavy boundary. (8 to 16 inches thick)

A12—9 to 18 inches; dark gray (10YR 4/1) stony loam, black (10YR 2/1) moist; weak medium subangular blocky structure that parts to moderate fine granular; slightly hard, friable, slightly sticky and slightly plastic; 15 percent cobbles and stones; neutral; clear smooth boundary. (8 to 12 inches thick)

B21t—18 to 24 inches; yellowish brown (10YR 5/4) stony clay loam, dark brown (10YR 4/3) moist; moderate medium subangular blocky structure that parts to moderate fine granular; hard, firm, sticky and plastic; moderate continuous clay films; 15 percent cobbles and stone; neutral; clear wavy boundary. (4 to 8 inches thick)

B22t—24 to 36 inches; brown (7.5YR 5/4) stony heavy clay loam, dark brown (7.5YR 4/4) moist; moderate medium angular and subangular blocky structure; extremely hard, firm, very sticky and very plastic; moderate continuous clay films; 20 to 30 percent cobbles and stone; neutral; clear wavy boundary. (10 to 16 inches thick)

C—36 to 60 inches; light gray (10YR 7/2) stony heavy clay loam, light brownish gray (10YR 6/2) moist; massive; hard, firm, sticky and plastic; few roots; 20 to 30 percent cobbles and stone; neutral.

The mollic epipedon ranges from 16 to 24 inches thick, and the solum ranges from 30 to 50 inches thick. The A horiozn has value of 4 or 5 dry and 2 or 3 moist and has chroma of 1 to 3 dry and moist. The B horizon as hue of 7.5YR to 2.5Y, value of 4 or 5 dry and 3 or 4 moist, and chroma of 3 or 4 dry and moist. Texture is heavy clay loam or light clay. Clay content ranges from 35 to 44 percent in the B horizon. Reaction is neutral or slightly acid. Cobble and stone range from 15 to 30 percent by volume. Texture of the C horizon ranges from heavy loam to light clay. The content of cobbles and stones ranges from 15 to 30 percent in the C horizon.

Colona series

The Colona series consists of deep, well drained soils that formed in fine textured alluvium from silty calcareous shale. Colona soils are on alluvial fans, low terraces, and valley foot slopes. Slopes are 1 to 40 percent. Average annual precipitation is about 12 inches, and average annual air temperature is about 47 degrees F.

Colona soils are similar to Bulkley and Razor soils and are near Midway, Gaynor, and Limon soils. Bulkley soils are noncalcareous at a depth of less than 27 inches and have average annual soil temperature of 47 degrees F. Razor and Gaynor soils have weathered shale bedrock at a depth of 20 to 40 inches. Midway soils have weathered shale bedrock at a depth of less than 20 inches. Limon soils do not have a B horizon.

Typical pedon of Colona silty clay loam, 6 to 12 percent slopes, Current Creek drainage, SW1/4SE1/4 Sec. 14, T. 13 S., R. 94 W., in Delta County:

A1—0 to 3 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate fine platy structure parting to moderate fine granular; hard, friable, sticky and plastic; few fine and very fine roots; calcareous; mildly alkaline; clear smooth boundary. (3 to 7 inches thick)

B1—3 to 10 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; weak medium platy structure parting to weak medium and coarse subangular blocky; hard, firm, sticky and plastic; few fine medium roots; cracks up to 1/2 inch; shiny pressure faces; calcareous; moderately alkaline; clear wavy boundary. (5 to 10 inches thick)

B2—10 to 23 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; weak medium and coarse subangular and angular blocky structure; very hard, firm, sticky and plastic; few fine and medium roots; cracks up to 1/2 inch; shiny pressure faces; calcareous; moderately alkaline; gradual wavy boundary. (11 to 15 inches thick)

Cca—23 to 60 inches; light gray (2.5Y 7/2) silty clay, dark grayish brown (2.5Y 4/2) moist; very hard, firm, sticky and plastic; few cracks and shiny pressure faces; calcareous; visible secondary accumulation of lime; moderately alkaline.

Cracks are as much as 1/2 inch wide. The content of gravel size sandstone and shale fragments ranges from 0 to 10 percent. The soils are calcareous to the surface.

The A1 horizon has value of 5 or 6 dry and 4 or 5 moist and has chroma of 2 or 3 dry and moist. The B horizon has hue of 2.5Y or 5Y, value of 5 to 7 dry and 4 to 6 moist, and chroma of 2 to 4 dry and moist. Texture is silty clay loam, silty clay, or clay. Clay content ranges from 35 to 50 percent in the B horizon. The content of carbonates ranges from 5 to 14 percent. Shiny pressure faces of peds are common. Texture of the C horizon is silty clay or clay. Secondary accumulations of lime are in this horizon.

Curecanti series

The Curecanti series consists of deep, well drained soils that formed in old landslide deposits and glacial outwash from igneous origin. Curecanti soils are on mountain slopes and foothills. Slopes range from 3 to 40 percent. Average annual precipitation is about 18 inches, and average annual air temperature is about 43 degrees F.

Curecanti soils are similar to Radersburg soils and are near Delson, Fughes, Cerro, and Work soils. Radersburg, Delson, Fughes, Cerro, and Work soils have more than 35 percent clay in the B horizon. Radersburg, Cerro, and Work soils are calcareous in the C horizon. Delson, Fughes, Cerro, and Work soils have less than 35 percent rock fragments in the B horizon.

Typical pedon of Curecanti stony loam, in an area of Fughes-Curecanti stony loams, 10 to 40 percent slopes, near center Sec. 16, T. 12 S., R. 89 W.:

A11—0 to 9 inches; dark grayish brown (10YR 4/2) stony loam, very dark brown (10YR 2/2) moist; moderate medium granular structure; soft, friable, slightly sticky and slightly plastic; 5 to 15 percent cobble and stone; common fine and medium roots; neutral; clear wavy boundary. (8 to 10 inches thick)

A12—9 to 13 inches; brown (10YR 5/3) stony loam, dark brown (10YR 3/3) moist; weak medium subangular blocky structure parting to moderate medium granular; slightly hard, friable, slightly sticky and slightly plastic; 20 percent cobble and stone; common fine and very fine roots; neutral; clear wavy boundary. (3 to 5 inches thick)

B21t—13 to 26 inches; dark brown (7.5YR 4/4) very gravelly clay loam, dark brown (7.5YR 3/4) moist; moderate medium subangular blocky parting to fine subangular blocky structure; hard, firm, slightly sticky and slightly plastic; 40 percent gravel, cobble and stone; moderate continuous clay films; few fine and very fine roots; neutral; clear wavy boundary. (11 to 15 inches thick)

B22t—26 to 37 inches; dark brown (7.5YR 4/4) very cobbly clay loam, brown (7.5YR 5/4) moist; moderate, medium subangular blocky structure; hard, firm, slightly sticky and slightly plastic; 50 percent cobble and stone; few fine and very fine roots; moderate continuous clay films; neutral; gradual wavy boundary. (10 to 14 inches thick)

B3—37 to 42 inches; brown (7.5YR 5/4) very stony clay loam, dark brown (7.5YR 4/4) moist; weak medium subangular blocky structure; hard, firm, slightly sticky and slightly plastic; 40 to 60 percent cobble and stone; thin patchy clay films; few fine roots; neutral; gradual wavy boundary. (4 to 8 inches thick)

C—42 to 60 inches; yellowish brown (10YR 5/4) very stony loam, dark yellowish brown (10YR 4/4) moist; massive; loose; 40 to 50 percent cobble, gravel, and stone; neutral.

The mollic epipedon ranges from 8 to 16 inches thick, and the solum ranges from 35 to 50 inches thick. The A horizon has value of 4 or 5 dry and 2 or 3 moist and has chroma of 2 or 3 dry and moist. The B horizon has hue of 7.5YR or 10YR, value of 4 or 5 dry and 3 or 4 moist, and chroma of 3 or 4 dry and moist; Texture of the fine earth fraction is clay loam. Clay content ranges from 27 to 35 percent in the B horizon. Rock fragments range from 35 to 70 percent by volume. Reaction is neutral or slightly acid. Texture of the C horizon ranges from very stony loam to cobbly fine sandy loam.

Delson series

The Delson series consists of deep, well drained soils that formed in stony outwash alluvium from igneous origin. Delson soils are on mesas, benches, and fans. Slopes range from 3 to 60 percent. Average annual precipitation is about 17 inches, and average annual air temperature is about 44 degrees F.

Delson soils are similar to Fughes and Cerro soils and are near Radersburg, Work, and Absarokee soils. Fughes soils have a mollic epipedon that is more than

16 inches thick. Cerro, Radersburg, Work, and Absarokee soils are calcareous in the C horizon. Radersburg soils have more than 35 percent rock fragments in the B horizon. Absarokee soils have sandstone at a depth of 20 to 40 inches.

Typical pedon of Delson stony loam, 3 to 20 percent slopes, Oak Mesa, NE1/4 Sec. 25, T. 13 S., R. 93 W., in Delta County:

A1—0 to 8 inches; dark brown (7.5YR 4/2) stony loam, very dark brown (7.5YR 2/2) moist; weak fine subangular blocky structure that parts to moderate fine granular; soft, friable, slightly sticky and slightly plastic; many medium and fine roots; 5 percent basalt stones; neutral; clear smooth boundary. (4 to 12 inches thick)

B1—8 to 12 inches; dark brown (7.5YR 4/2) clay loam, very dark brown (7.5YR 2/2) moist; weak medium subangular blocky structure that parts to moderate coarse granular; slightly hard, friable, sticky and plastic; thin patchy clay films; many medium and fine roots; 5 percent basalt stones; neutral; clear smooth boundary. (0 to 8 inches thick)

B2t—12 to 34 inches; reddish brown (5YR 4/4) light clay, dark reddish brown (5YR 3/4) moist; moderate medium prismatic structure that parts to strong medium angular blocky; extremely hard, very firm, very sticky and plastic; moderate continuous clay films, few medium and coarse roots; 10 percent basalt stones; neutral; gradual wavy boundary. (10 to 30 inches thick)

B3—34 to 42 inches; brown (7.5YR 5/4) stony clay loam, dark brown (7.5YR 4/4) moist; moderate medium subangular blocky structure; hard, friable, sticky and plastic; few thin patchy clay films; very few coarse roots; 20 percent basalt stones; neutral grading to mildly alkaline in lower part; gradual wavy boundary. (4 to 12 inches thick)

C—42 to 60 inches; pale brown (10YR 6/3) stony clay loam, brown (10YR 5/3) moist; massive, hard, sticky and slightly plastic; 30 percent basalt stones; mildly alkaline.

The soils are noncalcareous to a depth of 6 inches or more. The content of cobble and stone ranges up to 35 percent. The mollic epipedon ranges from 10 to 16 inches thick.

The A1 horizon has value of 3 or 4 dry and 2 or 3 moist and has chroma of 2 or 3 dry and moist. Texture is commonly stony or very stony loam but is loam in places. The B horizon has hue of 7.5YR and 5YR, value of 4 or 5 dry and 3 or 4 moist, and chroma of 3 or 4 dry and moist. Texture is heavy clay loam or light clay. Clay content ranges from 35 to 45 percent in the B horizon. Stone content ranges from 5 to 20 percent. Texture of the C horizon is stony loam, stony clay loam, or very stony clay loam.

Fughes series

The Fughes series consists of deep, well drained soils that formed in alluvium and old landslide deposits from materials of sedimentary origin. Fughes soils are on alluvial fans, uplands, and valley side slopes. Slopes range from 3 to 65 percent. Average annual precipitation is about 18 inches, and average annual air temperature is about 42 degrees F.

Fughes soils are similar to Delson and Cerro soils and are near Radersburg, Work, and Absarokee soils. Delson soils have a mollic epipedon that is less than 16 inches thick. Cerro, Radersburg, Work, and Absarokee soils are calcareous in the substrata and have a mollic epipedon that is less than 16 inches thick. Radersburg soils have more than 35 percent rock fragments in the B horizon. Absarokee soils have sandstone bedrock at a depth of 20 to 40 inches.

Typical pedon of Fughes loam, 15 to 25 percent slopes, Jacobs Ranch, Muddy Creek, SE1/4 Sec. 29, T. 11 S., R. 89 W., in Gunnison County:

A1—0 to 5 inches; very dark grayish brown (10YR 3/2) loam, very dark brown (10YR 2/2) moist; weak fine and medium granular structure; soft, very friable, many medium and fine roots; neutral, clear smooth boundary. (3 to 9 inches thick)

B1—5 to 18 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure that parts to weak fine subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; many medium and fine roots; neutral; clear wavy boundary. (6 to 16 inches thick)

B2t—18 to 30 inches; reddish brown (5YR 5/4) light clay, reddish brown (5YR 4/4) moist; moderate medium prismatic structure that parts to moderate medium subangular blocky; extremely hard, very firm, sticky and plastic; moderate thick continuous clay films on faces of peds; common fine and medium roots; neutral; gradual wavy boundary. (6 to 16 inches thick)

B3—30 to 44 inches; light reddish brown (5YR 6/4) clay loam, reddish brown (5YR 5/4) moist; weak medium subangular blocky structure; hard, firm, sticky and plastic; few thin clay films on faces of peds; neutral; gradual wavy boundary. (4 to 16 inches thick)

C—44 to 60 inches; light reddish brown (5YR 6/4) clay loam, reddish brown (5YR 5/4) moist; massive; hard, firm, sticky and plastic; neutral.

The mollic epipedon ranges from 16 to 40 inches thick. Reaction is neutral or mildly alkaline.

The A horizon has value of 3 to 5 dry and 2 or 3 moist and has chroma of 2 or 3 dry and moist. Texture is loam or stony loam. Stone content ranges to 20 percent. The B horizon has hue of 7.5YR or 5YR, value of 2 to 5 dry and 2 to 4 moist, and chroma of 2 to 4 dry and moist.

Texture is heavy clay loam or light clay. Clay content ranges from 36 to 50 percent in the B horizon. Rock fragments, mainly gravel size, range from 0 to 15 percent by volume. Texture of the C horizon ranges from light clay loam to clay.

Gaynor series

The Gaynor series consists of moderately deep, well drained soils that formed in place and from some locally transported sediment from silty calcareous shale. Gaynor soils are on upland side slopes and ridge tops. Slopes range from 10 to 40 percent. Average annual precipitation is about 14 inches, and average annual air temperature is about 47 degrees F.

Gaynor soils are similar to Midway and Killpack soils and are near Razor, Colona, and Limon soils. Midway soils have silty calcareous shale at a depth of less than 20 inches. Killpack and Razor soils are silty clay loam throughout. Razor and Colona soils have a B horizon. Colona and Limon soils are more than 60 inches deep.

Typical pedon of Gaynor silty clay loam, in an area of Midway-Gaynor silty clay loams, 10 to 40 percent slopes, NE1/4NE1/4 Sec. 25, T. 13 S., R. 94 W., Delta County:

A1—0 to 4 inches; light brownish gray (2.5Y 6/2) silty clay loam, olive brown (2.5Y 4/4) moist; weak medium platy structure parting to strong fine granular; slightly hard, friable, sticky and plastic; few medium and fine roots; calcareous; mildly alkaline; clear smooth boundary. (3 to 7 inches thick)

AC—4 to 12 inches; pale yellow (2.5Y 7/4) silty clay, light olive brown (2.5Y 5/4) moist; weak coarse subangular blocky structure parting to weak fine and medium subangular blocky; very hard, firm, sticky and plastic; few medium and fine roots; calcareous; mildly alkaline; clear wavy boundary. (6 to 12 inches thick)

C1—12 to 30 inches; pale yellow (2.5Y 7/4) silty clay, light olive brown (2.5Y 5/4) moist; weak medium and coarse subangular blocky structure; very hard, firm, sticky and plastic; shale chips range up to 20 percent near the contact of the shale; calcareous; moderately alkaline; gradual wavy boundary. (11 to 21 inches thick)

C2r—30 inches; soft weathered calcareous shale.

The ochric epipedon ranges from 3 to 6 inches thick. The soils are calcareous throughout.

The A horizon has value of 5 or 6 dry and 4 or 5 moist and has chroma of 2 to 6 dry and moist. Texture is commonly silty clay loam but ranges from silty loam to silty clay. The C horizon has hue of 2.5Y or 5Y, value of 5 to 7 dry and 4 to 6 moist, and chroma of 2 to 4 dry and moist. Texture is silty clay or silty clay loam. Clay content ranges from 35 to 45 percent in the C horizon. Content of secondary lime and gypsum is erratic and ranges from 0.5 to 15 percent. The content of shale fragments in the lower part of this horizon range up to 20 percent. Silty calcareous shale is at a depth of 20 to 40 inches.

Glenton series

The Glenton series consists of deep, well drained soils that formed in recent alluvium from materials of mixed origin. Glenton soils are on alluvial fans and terraces. Slopes range from 0 to 6 percent. Average annual precipitation is about 9 inches, and average annual air temperature is about 51 degrees F.

Glenton soils are similar to Billings and Cliffdown soils and are near Chipeta, Persayo, Lazear, and Shavano soils. Billings soils have a silty clay loam A horizon and AC horizon. Cliffdown soils have more than 35 percent rock fragments in the C horizon. Chipeta and Persayo soils have silty calcareous shale at a depth of less than 20 inches. Lazear soils have hard sandstone bedrock at a depth of less than 20 inches, and Shavano soils have hard sandstone at a depth of 20 to 40 inches.

Typical pedon of Glenton fine sandy loam, 0 to 3 percent slopes, SE1/4 Sec. 33, T. 4 S., R. 3 E., (Ute PM), in Delta County:

Ap—0 to 5 inches; light brownish gray (10YR 6/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; weak very fine granular structure; soft, very friable; few fine and very fine roots; calcareous; moderately alkaline; clear smooth boundary. (3 to 8 inches thick)

C1—5 to 13 inches; light brownish gray (10YR 6/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; massive; soft, very friable; few fine and medium roots; calcareous; moderately alkaline; clear smooth boundary. (5 to 10 inches thick)

C2—13 to 16 inches; light brownish gray (10YR 6/2) fine sandy loam, grayish brown (10YR 5/2) moist; massive; soft, friable; very few fine and very fine roots; calcareous; strongly alkaline; clear smooth boundary. (2 to 8 inches thick)

C3—16 to 60 inches; light brownish gray (10YR 6/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; massive; soft, friable, calcareous; strongly alkaline.

The A horizon has value of 5 or 6 dry and 4 or 5 moist and has chroma of 2 or 3 dry and moist. The content of gravel size fragments ranges from 0 to 10 percent. The control section has hue of 7.5YR or 10YR, value of 5 to 7 dry and 4 to 6 moist, and chroma of 2 or 3 dry and moist. Texture of the control section is fine sandy loam or sandy loam. Clay content ranges from 8 to 18 percent of the control section, and gravel content ranges from 0 to 10 percent. Texture of the lower part of the C horizon is stratified sandy loam, sandy clay loam, loam, and loamy sand. The content of gravel ranges up to 15 percent in this horizon.

Kech series

The Kech series consists of shallow, well drained soils that formed in place and from locally transported sediment from sandstone and interbedded shale. Kech soils are on upland hills and ridges. Slopes range from 3 to 40 percent. Average annual precipitation is about 14 inches, and average annual air temperature is about 44 degrees F.

Kech soils are similar to Progresso and Potts soils and are near Scholle, Mesa, and Agua Fria soils. Progresso soils have sandstone bedrock at a depth of 20 to 40 inches. Potts, Scholle, Mesa, and Agua Fria soils are more than 60 inches deep. Mesa soils are dry. Agua Fria soils have more than 35 percent clay in the B horizon.

Typical pedon of Kech loam, in an area of Kech-Progresso loams, 3 to 15 percent slopes, SW1/4 Sec. 13, T. 15 S., R. 93 W., in Delta County:

A1—0 to 4 inches; brown (7.5YR 5/2) loam, dark brown (7.5YR 4/2) moist; moderate very fine granular structure; soft, friable, slightly sticky and slightly plastic; few fine and medium roots; 5 to 15 percent sandstone channers; neutral; clear smooth boundary. (3 to 5 inches thick)

B2t—4 to 12 inches; brown (7.5YR 5/4) clay loam, dark brown (7.5YR 4/4) moist; moderate medium subangular blocky structure parting to moderate fine subangular blocky; hard, friable, sticky and plastic; few fine and very fine roots; moderate continuous clay films on peds; 5 to 10 percent sandstone channers; noncalcareous; mildly alkaline; clear wavy boundary. (4 to 9 inches thick)

B3ca—12 to 19 inches; pinkish white (7.5YR 8/2) channery loam, pink (7.5YR 7/4) moist; weak medium subangular blocky structure parting to weak fine subangular blocky; hard, firm, slightly sticky and slightly plastic; 25 to 30 percent sandstone channers; few thin patchy clay films; soft masses of secondary lime; mildly alklaine; clear irregular boundary. (4 to 8 inches thick)

R—19 inches; partially weathered calcareous sandstone.

The A horizon has value of 4 to 6 dry and 3 to 5 moist and has chroma of 2 or 3 dry and moist. The B horizon has hue of 7.5YR or 10YR, value of 5 or 6 dry and 4 or 5 moist, and chroma of 3 or 4 dry and moist. Texture of the B horizon is clay loam. Clay content ranges from 27 to 35 percent in this horizon, and sandstone channers range from 0 to 15 percent. Reaction is neutral or mildly alkaline. The B3 horizon contains visible secondary lime and has as much as 30 percent sandstone channers. Weathered sandstone bedrock is at a depth of 10 to 20 inches.

Killpack series

The Killpack series consists of moderately deep, well drained soils that formed in place and from some locally transported materials from silty calcareous shale. Killpack soils are on fans and upland slopes. Slopes range from 3 to 12 percent. Average annual precipitation is about 10 inches, and average annual air temperature is about 50 degrees F.

Killpack soils are similar to Persayo and Chipeta soils and are near Gaynor, Billings, and Glenton soils. Persayo and Chipeta soils have silty calcareous shale at a depth of less than 20 inches. Chipeta soils have a silty clay A horizon and C horizon. Gaynor soils have shale at a depth of 20 to 40 inches and more than 35 percent clay in the C horizon. Billings and Glenton soils are more than 60 inches deep. Glenton soils are fine sandy loam throughout.

Typical pedon of Killpack silty clay loam, 3 to 12 percent slopes, NE1/4 Sec. 32, T. 14 S., R. 94 W.:

A1—0 to 6 inches; light yellowish brown (2.5Y 6/3) silty clay loam, light olive brown (2.5Y 5/3) moist; weak very fine granular structure; slightly hard, firm, sticky and plastic; few fine and very fine roots; calcareous; moderately alkaline; clear smooth boundary. (4 to 8 inches thick)

AC—6 to 12 inches; light yellowish brown (2.5Y 6/3) silty clay loam, grayish brown (2.5Y 5/2) moist; weak medium subangular blocky structure; hard, firm, sticky and plastic; about 10 percent shale chips; calcareous; moderately alkaline; clear wavy boundary. (4 to 10 inches thick)

Ccs—12 to 26 inches; light gray (2.5Y 7/2) silty clay loam, grayish brown (2.5Y 5/2) moist; massive; hard, firm, sticky and plastic; 10 percent shale fragments; calcareous; many visible gypsum crystals; strongly alkaline; clear wavy boundary. (12 to 22 inches thick)

C2r—26 inches; soft weathered calcareous shale.

The A horizon has value of 5 or 6 dry and 4 to 5 moist and has chroma of 2 or 3 dry and moist. The C horizon has hue of 2.5Y or 5Y, value of 6 or 7 dry and 4 or 5 moist, and chroma of 2 or 3 dry and moist. Texture of the C horizon is silty clay loam. Clay content ranges from 27 to 35 percent in this horizon, and gypsum crystals range from 15 to 20 percent. The content of shale chips ranges up to 20 percent in the lower part of the C horizon, and soft weathered calcareous shale is at a depth of 20 to 40 inches.

Lazear series

The Lazear series consists of shallow, well drained soils that formed in material that was weathered in place from sandstone and interbedded shale. Lazear soils are on uplands and mountains. Slopes range from 3 to 30

percent. Average annual precipitation is about 10 inches, and average annual air temperature is about 51 degrees F.

Lazear soils are similar to Shavano and Persayo soils and are near Chipeta, Killpack, Glenton, and Billings soils. Shavano soils have sandstone bedrock at a depth of 20 to 40 inches. Persayo and Chipeta soils have silty calcareous shale at a depth of less than 20 inches. Persayo soils are silty clay loam, and Chipeta soils are silty clay. Killpack soils have silty calcareous shale at a depth of 20 to 40 inches and are silty clay loam. Glenton and Billings soils are deep and are stratified in the lower part of the profile.

Typical pedon of Lazear gravelly loam, in an area of Shavano-Lazear complex, 3 to 12 percent slopes, SW1/4NW1/4 Sec. 29, T. 4 S., R. 3 E., in Delta County:

A1—0 to 4 inches; light brownish gray (10YR 6/2) gravelly loam, dark grayish brown (10YR 4/2) moist; moderate fine granular structure; soft, very friable; 15 percent small sandstone fragments; calcareous; moderately alkaline; clear smooth boundary. (3 to 5 inches thick)

C—4 to 14 inches; light brown (7.5YR 6/3) gravelly loam, dark brown (7.5YR 4/3) moist; massive; slightly hard, very friable; 20 percent small sandstone fragments; calcareous; moderately alkaline; abrupt wavy boundary. (7 to 17 inches thick)

R—14 inches; hard calcareous sandstone bedrock.

The A horizon has value of 5 to 7 dry and 3 to 5 moist and has chroma of 2 or 3 dry and moist. The C horizon has hue of 7.5YR to 2.5Y, value of 5 or 6 dry and 4 or 5 moist, and chroma of 2 to 4 dry and moist. The content of flat, gravel size fragments in the profile ranges from 0 to 35 percent but is generally 15 to 20 percent. Reaction is moderately alkaline or strongly alkaline throughout. The sandstone bedrock is at a depth of less than 20 inches.

Limon series

The Limon series consists of deep, well drained soils that formed in fine textured alluvium from silty calcareous shale. Limon soils are on alluvial fans. Slopes range from 0 to 6 percent. Average annual precipititon is about 11 inches, and average annual air temperature is about 48 degrees F.

Limon soils are similar to Gaynor and Midway soils and are near Killpack, Billings, Persayo, and Chipeta soils. Gaynor soils have silty calcareous shale at a depth of 20 to 40 inches, and Midway soils have silty calcareous shale at a depth of less than 20 inches. Killpack, Billings, and Persayo soils have a silty clay loam AC or C horizon. Persayo soils have silty calcareous shale at a depth of less than 20 inches, and Killpack soils have shale at a depth of 20 to 40 inches. Billings soils are deep and stratified in the lower part of the profile. Chipeta soils are silty clay with shale bedrock at a depth of less than 20 inches.

Typical pedon of Limon silty clay loam, 0 to 3 percent slopes, 1 1/2 miles south, 1/2 mile west of Hotchkiss, NW1/4SE1/4 Sec. 1, T. 15 S., R. 93 W., in Delta County:

A1—0 to 4 inches; grayish brown (2.5Y 5/2) silty clay loam, very dark grayish brown (2.5Y 3/2) moist; moderate medium granular structure; slightly hard, friable, sticky and plastic; few fine and medium roots; calcareous; moderately alkaline; clear wavy boundary. (2 to 6 inches thick)

AC—4 to 21 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; weak medium angular blocky structure; very hard, firm, very sticky and very plastic; few medium and fine roots; cracks up to 1/2 inch, shiny pressure faces; calcareous; moderately alkaline; gradual wavy boundary. (10 to 20 inches thick)

Cca—21 to 60 inches; light brownish gray (2.5Y 6/2) silty clay, grayish brown (2.5Y 5/2) moist; weak coarse angular and subangular blocky structure; very hard, firm, very sticky and very plastic; 10 percent shale chips; visible secondary lime and gypsum; calcareous; moderately alkaline.

The A horizon has value of 5 to 7 dry and 3 to 5 moist and has chroma of 2 or 3 dry and moist. The control section (10 to 40 inches) has hue of 2.5Y or 5Y, value of 5 to 7 dry and 4 to 6 moist, and chroma of 2 or 3 dry and moist. Texture is heavy silty clay loam or silty clay. The content of clay ranges from 35 to 50 percent, and the content of carbonates ranges from 1 to 5 percent. Reaction is moderately alkaline or strongly alkaline.

Meeteetse series

The Meeteetse series consists of deep, well drained soils that formed in stony outwash alluvium from material that was weathered from basalt. Meeteetse soils are on alluvial fans, terraces, and upland side slopes. Slopes range from 3 to 20 percent. Average annual precipitation is about 10 inches, and average annual air temperature is about 51 degrees F.

Meeteetse soils are similar to Uffens soils and are near Utaline, Mesa, and Glenton soils. Uffens and Mesa soils have less than 35 percent clay in the B horizon. Glenton soils have less than 18 percent clay in the C horizon and are stratified with sandy loam, loam, and clay loam in the lower part of the C horizon.

Typical pedon of Meeteetse stony loam, 3 to 20 percent slopes, SW1/4 Sec. 15, T. 14 S., R. 3 E., (Ute PM), in Delta County:

A2—0 to 2 inches; pink (7.5YR 7/3) pinkish gray (7.5YR 6/2) moist; weak very fine platy structure parting to weak fine granular; soft, very friable, slightly sticky

and slightly plastic; 10 percent basalt stone; calcareous; moderately alkaline; abrupt smooth boundary. (1 to 4 inches thick)

B21t—2 to 8 inches; brown (7.5YR 5/4) gravelly heavy clay loam, dark brown (7.5YR 4/4) moist; moderate, medium, columnar structure parting to strong fine subangular blocky; hard, firm, very sticky and very plastic; moderate continuous clay films; 15 percent basalt gravel; calcareous; very strongly alkaline; clear wavy boundary. (4 to 8 inches thick)

B22t—8 to 16 inches; light brown (7.5YR 6/4) stony clay, brown (7.5YR 5/4) moist; moderate coarse subangular blocky structure; few visible salts; hard, firm, very sticky and very plastic; thin patchy clay films; 20 percent basalt stone; calcareous; very strongly alkaline; clear wavy boundary. (6 to 15 inches thick)

Ccssa—16 to 60 inches; light brown (7.5YR 6/4) stony heavy clay loam, brown (7.5YR 5/4) moist; massive; hard, firm, sticky and plastic; visible salts in the form of crystals; 30 percent basalt stone and cobbles; calcareous; strongly alkaline.

The soils are typically calcareous at or near the surface. The solum ranges from 15 to 30 inches thick.

The A2 horizon has value of 6 or 7 dry and 5 or 6 moist and has chroma of 2 or 3 dry and moist. This horizon ranges from 1 to 4 inches thick. The B horizon has hue of 5YR or 7.5YR, value of 5 or 6 dry and 4 or 5 moist, and chroma of 3 or 4 dry and moist. Texture of the B horizon is generally clay but ranges to clay loam. The content of clay ranges from 35 to 45 percent, and the content of rock fragments ranges from 5 to 30 percent.

Mesa series

The Mesa series consists of deep, well drained soils that formed in cobbly alluvium from material of igneous origin. Mesa soils are on mesas, terraces, and benches. Slopes range from 0 to 12 percent. Average annual precipitation is about 10 inches, and average annual air temperature is about 50 degrees F.

Mesa soils are similar to Agua Fria soils and near Utaline, Avalon, and Cliffdown soils. Agua Fria soils have more than 35 percent clay in the B horizon. Utaline, Avalon, and Cliffdown soils do not have a textural B horizon. Utaline and Cliffdown soils have more than 35 percent rock fragments in the C horizon.

Typical pedon of Mesa loam, 3 to 6 percent slopes, NW1/4SW1/4 Sec. 30, T. 15 S., R. 96 W., in Delta County:

A1—0 to 4 inches; light brown (7.5YR 6/4) loam, dark brown (7.5YR 4/4) moist; weak fine platy structure that parts to moderate medium granular; soft, very friable, slightly sticky and slightly plastic; few fine roots; 10 percent gravel; calcareous; mildly alkaline; clear smooth boundary. (2 to 6 inches thick)

B2t—4 to 10 inches; brown (7.5YR 5/4) light clay loam, dark brown (7.5YR 4/4) moist; moderate medium fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; thin continuous clay films; few fine discontinuous pores; 10 percent gravel; calcareous; moderately alkaline; gradual smooth boundary. (4 to 8 inches thick)

B3ca—10 to 20 inches; light brown (7.5YR 6/4) clay loam, brown (7.5YR 5/4) moist; weak medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few fine discontinuous pores; thin patchy clay films; 10 percent gravel; calcareous, lime in streaks and nodules; moderately alkaline; gradual wavy boundary. (8 to 12 inches thick)

IIC1ca—20 to 30 inches; pinkish white (7.5YR 8/2) gravelly loam, light brown (7.5YR 6/4) moist; massive; hard, friable, slightly sticky and slightly plastic; 30 percent cobble and gravel; calcareous; secondary lime well disseminated; moderately alkaline; gradual wavy boundary. (8 to 12 inches thick)

IIC2ca—30 to 60 inches; pinkish white (7.5YR 8/2) very gravelly loam, light brown (7.5YR 6/4) moist; massive; hard, friable, slightly sticky and slightly plastic; 50 percent gravel and cobble; calcareous; visible secondary lime well disseminated; moderately alkaline.

The solum ranges from 12 to 40 inches thick.

The A horizon has value of 5 to 7 dry and 4 to 6 moist and has chroma of 2 to 4 moist and dry. The B horizon has hue of 7.5YR to 2.5YR, value of 5 to 7 dry and 4 to 6 moist, and chroma of 3 or 4 moist and dry. Texture of the B horizon is dominantly clay loam but ranges to loam. The content of clay ranges from 18 to 35 percent. This horizon is mildly alkaline or moderately alkaline. The IIC horizon is gravelly or very gravelly loam. The content of rock fragments exceeds 35 percent in the lower part of the IIC horizon, and the calcium carbonate equivalent ranges from 15 to 40 percent.

Midway series

The Midway series consists of shallow, well drained soils that formed in place from silty calcareous shale. Midway soils are on upland side slopes and ridge tops. Slopes range from 10 to 40 percent. Average annual precipitation is about 14 inches, and average annual air temperature is about 47 degrees F.

Midway soils are similar to Gaynor soils and are near Colona, Razor, and Limon soils. Gaynor and Razor soils have calcareous shale bedrock at a depth of 20 to 40 inches. Colona and Limon soils are more than 60 inches deep. Razor and Colona soils have a B horizon.

Typical pedon of Midway silty clay loam, in an area of Midway-Gaynor silty clay loams, 10 to 40 percent slopes, NW1/4 Sec. 24, T. 13 S., R. 94 W., in Delta County:

A1—0 to 3 inches; light yellowish brown (2.5Y 6/4) silty clay loam, olive brown (2.5Y 4/4) moist; weak medium platy structure parting to moderate medium granular; slightly hard, friable, slightly sticky and slightly plastic; few fine and medium roots; calcareous; moderately alkaline; clear smooth boundary. (2 to 4 inches thick)

AC—3 to 11 inches; light yellowish brown (2.5Y 6/4) silty clay, light olive brown (2.5Y 5/4) moist; weak medium subangular blocky structure; very hard, firm, very sticky and very plastic; about 10 percent shale chips; calcareous; moderately alkaline; clear wavy boundary. (2 to 9 inches thick)

C1ca—11 to 16 inches; pale yellow (2.5Y 7/4) silty clay, light yellowish brown (2.5Y 6/4) moist; massive; very hard, firm, very sticky and very plastic; about 10 percent shale chips; calcareous; moderately alkaline; clear wavy boundary. (2 to 7 inches thick)

C2r—16 inches; slightly weathered Mancos shale.

The soils are mildly alkaline or moderately alkaline throughout.

The A horizon has value of 5 to 6 dry and 3 or 4 moist and has chroma of 2 to 4 dry and moist. The AC horizon and the C1ca horizon have hue of 2.5Y or 5Y, value of 5 to 7 dry and 3 to 5 moist, and chroma of 2 to 4 dry and moist. Texture is dominantly silty clay or clay but ranges to silty clay loam. The content of clay ranges from 35 to 50 percent. The content of shale chips ranges from 5 to 30 percent in the C horizon. Depth to soft calcareous shale bedrock is 10 to 20 inches.

Northwater series

The Northwater series consists of deep, well drained soils that formed in cobbly alluvium and glacial drift from igneous origin. Northwater soils are on outwash fans, terraces, and mountain slopes. Slopes range from 5 to 65 percent. Average annual precipitation is about 22 inches, and average annual air temperature is about 39 degrees F.

Northwater soils are similar to Cochetopa soils and are near Fughes, Delson, Radersburg, and Cerro soils. Cochetopa soils have less than 35 percent rock fragments in the B horizon. Fughes, Delson, Radersburg, and Cerro soils have a summer soil temperature greater than 59 degrees F. Delson, Radersburg, and Cerro soils have a mollic epipedon that is less than 16 inches thick, and Radersburg and Cerro soils are calcareous in the C horizon.

Typical pedon of the Northwater loam, 5 to 25 percent slopes, NE1/4 Sec. 25, T. 51 N., R. 6 W., in Gunnison County:

O1—0 to 2 inches; partially decomposed grass, leaves and twigs.

A11—0 to 11 inches; dark brown (10YR 4/3) loam; very dark brown (10YR 2/2) moist; moderate medium granular structure; soft, very friable, non-sticky and non-plastic; common, fine and medium roots; 10 percent gravel; slightly acid; clear smooth boundary. (6 to 12 inches thick)

A12—11 to 25 inches; brown (10YR 5/3) heavy loam, very dark grayish brown (10YR 3/2) moist; weak medium and fine subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; few fine and medium roots; few discontinuous diagonal pores; 10 percent cobble and gravel; slightly acid; clear wavy boundary. (12 to 16 inches thick)

B2t—25 to 38 inches; yellowish brown (10YR 5/4) very cobbly clay loam, dark yellowish brown (10YR 4/4) moist; moderate medium subangular blocky structure; hard, friable, sticky and plastic; few fine roots; few discontinuous diagonal pores; 40 percent cobble and gravel; moderate continuous clay films; neutral; gradual wavy boundary. (10 to 15 inches thick)

B3—38 to 44 inches; yellowish brown (10YR 5/4) very cobbly clay loam, dark yellowish brown (10YR 4/4) moist; weak medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few discontinuous diagonal pores; 50 percent cobble and gravel, some stones; thin patchy clay films; neutral; gradual wavy boundary. (4 to 6 inches thick)

C—44 to 60 inches; pale brown (10YR 6/3) very cobbly loam, brown (10YR 5/3) moist; hard, friable, slightly sticky and slightly plastic; 50 percent cobble; neutral.

The mollic epipedon ranges from 16 to 30 inches thick. The soils are noncalcareous and have more than 35 percent cobble, gravel, and stone in the B horizon.

The A horizon has value of 4 or 5 dry and 2 to 3 moist and has chroma of 2 or 3 dry and moist. The B horizon has value of 5 or 6 dry and 4 or 5 moist and has chroma of 3 or 4 dry and moist. Texture of the B horizon is very gravelly or very cobbly clay loam. The content of clay ranges from 27 to 35 percent. Cobble, gravel, and stone range from 35 to 65 percent by volume. Reaction is slightly acid or neutral. Texture of the C horizon is very cobbly or very gravelly loam or light clay loam, and the content of cobble, gravel, and stone ranges from 35 to 70 percent.

Persayo series

The Persayo series consists of shallow, well drained soils that formed in place from weathered calcareous silty shale. Persayo soils are on uplands. Slopes range from 12 to 35 percent. Average annual precipitation is about 9 inches, and average annual air temperature is about 51 degrees F.

Persayo soils are similar to Chipeta and Killpack soils and are near Billings, Lazear, and Shavano soils. Chipeta soils have more than 35 percent clay in the A horizon and the C horizon. Killpack soils have shale at a depth of 20 to 40 inches. Billings soils are more than 60 inches deep and are stratified in the lower part of the profile.

Lazear soils have hard sandstone at a depth of less than 40 inches, and Shavano soils have sandstone bedrock at a depth of 20 to 40 inches.

Typical pedon of Persayo silty clay loam, 12 to 35 percent slopes, NW1/4NE1/4 Sec. 29, T. 14 S., R. 95 W., in Delta County:

A1—0 to 4 inches; light yellowish brown (2.5Y 6/4) silty clay loam, light olive brown (2.5Y 5/4) moist; weak to moderate fine platy structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; calcareous; moderately alkaline; clear smooth boundary. (3 to 7 inches thick)

C1—4 to 15 inches; light brownish gray (2.5Y 6/2) silty clay loam, olive brown (2.5Y 4/4) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; 10 percent shale fragments; calcareous; some secondary lime and gypsum; moderately alkaline; gradual smooth boundary. (7 to 13 inches thick)

C2r—15 inches; gray and yellow calcareous silty shale.

The soils have an average annual soil temperature of about 51 degrees F.

The A horizon has value of 5 to 7 dry and 4 or 5 moist and has chroma of 2 to 4 dry and moist. The C horizon has hue of 10YR to 5Y, value of 5 to 7 dry and 4 or 5 moist, and chroma of 2 to 4 dry and moist. Texture of the C horizon is dominantly silty clay loam ranging to silt loam. The content of clay ranges from 18 to 35 percent. Reaction is moderately alkaline or strongly alkaline. This horizon contains some visible calcium carbonate and calcium sulfate. Gray and yellow calcareous silty shale is at a depth of less than 20 inches.

Potts series

The Potts series consists of deep, well drained soils that formed in sediment that was weathered from sandstone. Potts soils are on alluvial fans and valley-filling side slopes. Slopes range from 1 to 6 percent. Average annual precipitation is about 12 inches, and average annual air temperature is about 46 degrees F.

Potts soils are similar to Progresso soils and are near the Scholle, Agua Fria, and Kech soils. Progresso soils have sandstone bedrock at a depth of 20 to 40 inches. Scholle soils have a stony A horizon and a gravelly clay loam B horizon. Agua Fria soils have more than 35 percent clay in the B horizon. Kech soils have sandstone bedrock at a depth of less than 20 inches.

Typical pedon of Potts loam, 1 to 6 percent slopes, Fruitland Mesa, NW1/4SE1/4 Sec. 16, T. 51 N., R. 8 W., in Delta County:

Ap—0 to 6 inches; light brown (7.5YR 6/4) loam, dark brown (7.5YR 4/4) moist; moderate medium granular structure that parts to moderate fine granular; slightly hard, friable, slightly sticky and slightly plastic; common medium and fine roots; neutral; clear smooth boundary. (4 to 8 inches thick)

B2t—6 to 12 inches; reddish brown (5YR 5/4) clay loam, reddish brown (5YR 4/4) moist; moderate medium subangular blocky structure that parts to strong fine subangular blocky; very hard, friable, sticky and plastic; few fine and very fine roots; thin continuous clay films; neutral; clear smooth boundary. (5 to 12 inches thick)

B3ca—12 to 16 inches; reddish brown (5YR 5/3) clay loam, reddish brown (5YR 4/3) moist; moderate medium subangular blocky structure that parts to moderate fine subangular blocky; very hard, friable, sticky and plastic; thin patchy clay films; few fine and medium roots; thin discontinuous seams of lime; calcareous; mildly alkaline; clear smooth boundary. (4 to 10 inches thick)

Cca—16 to 60 inches; light reddish brown (5YR 6/4) loam, reddish brown (5YR 5/4) moist; moderate medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; lime nodules; calcareous; moderately alkaline.

The soils have an ochric epipedon that ranges from 4 to 8 inches thick. The solum ranges from 15 to 30 inches thick.

The Ap horizon has value of 5 or 6 dry and 4 or 5 moist and has chroma of 3 or 4 dry and moist. The B horizon has hue of 5YR, value of 4 or 5 dry and moist, and chroma of 3 or 4 dry and moist. Texture of this horizon is heavy loam or light clay loam, and the content of clay ranges from 18 to 35 percent. The content of coarse fragments is generally less than 5 percent but ranges from 5 to 15 percent. Texture of the C horizon ranges from loam to light clay loam, and the content of calcium carbonates is less than 15 percent. Depth to bedrock is greater than 40 inches.

Progresso series

The Progresso series consists of moderately deep, well drained soils that formed in place and from some locally transported sediment from sandstone and interbedded shale. Progresso soils are on upland side slopes and alluvial fans. Slopes range from 1 to 15 percent. Average annual precipitation is about 12 inches, and average annual air temperature is about 46 degrees F.

Progresso soils are similar to Potts soils and are near Scholle, Kech, and Agua Fria soils. Potts soils are more than 40 inches deep over bedrock. Scholle soils have a stony loam A horizon and a gravelly clay loam B horizon. Kech soils have sandstone bedrock at a depth of less than 20 inches. Agua Fria soils have more than 35 percent clay in the B horizon.

Typical pedon of Progresso loam, in an area of Kech-Progresso loams, 3 to 15 percent slopes, SE1/4 Sec. 14, T. 15 S., R. 93 W., in Delta County:

A1—0 to 5 inches; pinkish gray (7.5YR 6/2) loam, dark brown (7.5YR 4/4) moist; weak very fine granular structure; soft, very friable, slightly sticky and slightly plastic; few fine and very fine roots; neutral; clear smooth boundary. (4 to 6 inches thick)

B2t—5 to 16 inches; brown (7.5YR 5/4) clay loam, dark brown (7.5YR 4/4) moist; moderate medium subangular blocky structure; hard, firm, sticky and plastic; few very fine roots; moderate continuous clay films; mildly alkaline; clear smooth boundary. (8 to 12 inches thick)

B3ca—16 to 22 inches; light brown (7.5YR 6/4) clay loam, brown (7.5YR 5/4) moist; weak medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; thin patchy clay films; visible lime seams; calcareous; mildly alkaline; gradual smooth boundary. (4 to 8 inches thick)

Cca—22 to 30 inches; white (10YR 8/2) channery loam, light yellowish brown (10YR 6/4) moist; weak medium and fine subangular blocky structure; hard, friable, slightly sticky and slightly plastic; 15 to 20 percent sandstone channery; calcareous; visible lime that is well disseminated; moderately alkaline; gradual smooth boundary. (6 to 10 inches thick)

R—30 inches; hard calcareous sandstone.

The solum ranges from 16 to 26 inches thick. The A horizon has value of 5 or 6 dry and 3 or 4 moist and has chroma of 2 to 4 dry and moist. The B horizon has hue of 10YR or 7.5YR, value of 5 or 6 dry and 4 or 5 moist, and chroma of 3 or 4 dry and moist. Texture of this horizon is clay loam or sandy clay loam, and the content of clay ranges from 27 to 35 percent. Reaction is neutral or mildly alkaline. Texture of the C horizon ranges from channery loam to light clay loam. Depth to sandstone bedrock ranges from 20 to 40 inches.

Radersburg series

The Radersburg series consists of deep, well drained soils that formed in cobbly alluvium from igneous origin. Radersburg soils are on old high terraces and mountain side slopes. Slopes range from 6 to 35 percent. Average annual precipitation is about 16 inches, and average annual air temperature is about 43 degrees F.

Radersburg soils are similar to Cerro and Work soils and are near Delson, Fughes, and Absarokee soils. Cerro and Work soils have less than 35 percent rock fragments in the B horizon. Delson and Fughes soils are non-calcareous in the C horizon. Fughes soils have a mollic epipedon more than 16 inches thick. Absarokee soils have sandstone bedrock at a depth of 20 to 40 inches.

Typical pedon of Radersburg loam, 6 to 12 percent slopes; NE1/4 Sec. 10, T. 50 N., R. 7 W., in Montrose County:

A1—0 to 5 inches; grayish brown (10YR 5/2) loam, very dark brown (10YR 2/2) moist; moderate medium granular structure; soft, very friable, slightly sticky and slightly plastic; few fine and medium fine roots; 10 percent gravel; non-calcareous; mildly alkaline; clear smooth boundary. (3 to 6 inches thick)

B1—5 to 9 inches; brown (7.5YR 5/2) very gravelly clay loam, dark brown (7.5YR 3/2) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few fine and medium roots; thin patchy clay films; 35 percent gravel and cobble; non-calcareous; mildly alkaline; clear wavy boundary. (3 to 6 inches thick)

B2t—9 to 15 inches; brown (7.5YR 5/2) very gravelly heavy clay loam, dark brown (7.5YR 4/2) moist; moderate medium subangular blocky structure; hard, firm, sticky and plastic; continuous clay films; 45 percent gravel and cobble; non-calcareous; mildly alkaline; clear wavy boundary. (4 to 12 inches thick)

B3ca—15 to 21 inches; light brown (7.5YR 6/4) very gravelly clay loam, brown (7.5YR 5/4) moist; moderate medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; thin patchy clay films; 50 percent gravel and cobble; calcareous; mildly alkaline; gradual wavy boundary. (4 to 8 inches thick)

Cca—21 to 60 inches; white (10YR 8/2) very gravelly loam, pale brown (10YR 6/3) moist; massive; hard, friable, slightly sticky and slightly plastic; 50 percent gravel and cobble; visible secondary lime which is well disseminated; calcareous; moderately alkaline.

The solum ranges from 15 to 30 inches thick. The mollic epipedon, which includes part of or all of the B horizon, ranges from 7 to 15 inches thick.

The A horizon has value of 4 or 5 dry and 2 or 3 moist and has chroma of 2 or 3 dry and moist. The B horizon has hue of 7.5YR or 10YR, value of 5 or 6 dry and 3 to 5 moist, and chroma of 2 to 4 dry and moist. Reaction is mildly alkaline or moderately alkaline. The content of coarse fragments ranges from 35 to 65 percent. The C horizon is very gravelly or cobbly loam or clay loam.

Razor series

The Razor series consists of moderately deep, well drained soils that formed in locally transported alluvium that was weathered from silty calcareous shale. Razor soils are on upland side slopes and fans. Slopes range from 3 to 12 percent. Average annual precipitation is about 14 inches, and average annual air temperature is about 46 degrees F.

Razor soils are similar to Colona and Bulkley soils and are near Midway, Limon, and Apishapa soils. Colona, Bulkley, and Limon soils are more than 40 inches deep. Midway soils have silty calcareous shale bedrock at a depth of less than 20 inches. Apishapa soils are poorly

drained to somewhat poorly drained and are mottled below a depth of about 9 inches.

Typical pedon of Razor silty clay loam, 3 to 12 percent slopes, .1 mile south and .1 mile west of NE corner Sec. 12, T. 51 N., R. 6 W., in Delta County:

A1—0 to 3 inches; pale brown (10YR 6/3) silty clay loam, dark brown (10YR 4/3) moist; moderate fine granular structure; loose; friable, sticky and plastic; few fine roots; calcareous; mildly alkaline; clear smooth boundary. (2 to 4 inches thick)

B1—3 to 5 inches; light olive brown (2.5Y 5/4) silty clay loam, olive brown (2.5Y 4/4) moist; moderate medium angular blocky structure; hard, firm, sticky and plastic; calcareous; moderately alkaline; clear smooth boundary. (2 to 6 inches thick)

B2—5 to 15 inches; light olive brown (2.5Y 5/4) silty clay loam, olive brown (2.5Y 4/4) moist; medium coarse angular blocky structure; hard, sticky and plastic; calcareous; moderately alkaline; gradual wavy boundary. (4 to 7 inches thick)

C1ca—15 to 26 inches; light olive brown (2.5Y 5/4) silty clay loam, olive brown (2.5Y 4/4) moist; massive; hard, firm, sticky and plastic; few gypsum crystals; visible seams and streaks of secondary lime increasing with depth; calcareous; moderately alkaline; gradual wavy boundary. (8 to 18 inches thick)

C2r—26 inches; soft silty calcareous shale.

The solum is 11 to 20 inches thick. The A1 horizon has value of 5 or 6 dry and 4 or 5 moist and has chroma of 3 or 4 dry or moist. The B horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 to 4 dry and moist. Texture of the B horizon is silty clay loam or silty clay, and the content of clay ranges from 35 to 50 percent. Texture of the C horizon is silty clay loam, silty clay, or clay loam. Depth to soft silty calcareous shale ranges from 20 to 40 inches.

Saraton series

The Saraton series consists of moderately deep, well drained soils that formed in cobbly or stony outwash alluvium that was weathered from material of basaltic origin. Saraton soils are on old terraces, mesas, and side slopes. Slopes range from 3 to 50 percent. Average annual precipitation is about 13 inches, and average annual air temperature is about 48 degrees F.

Saraton soils are similar to Avalon and Utaline soils and are near Agua Fria, Colona, and Razor soils. Avalon and Utaline soils do not have marl at a depth of 20 to 40 inches. They have dry moisture regimes. Agua Fria soils have more than 35 percent clay in the B horizon. Colona and Razor soils have a B horizon. Razor soils have silty calcareous shale bedrock at a depth of 20 to 40 inches.

Typical pedon of Saraton gravelly loam, 3 to 12 percent slopes, 1.4 miles east of Cedaredge SW1/4NE1/4 Sec. 28, T. 13 S., R. 94 W., in Delta County:

A1—0 to 5 inches; brown (7.5YR 5/4) gravelly loam, dark brown (7.5YR 4/4) moist; weak and moderate medium and fine granular structure; soft, very friable, slightly sticky and slightly plastic; many fine and medium roots; 20 percent basalt gravel, 10 percent basalt cobbles; calcareous; mildly alkaline; clear smooth boundary. (3 to 8 inches thick)

AC—5 to 10 inches; light brown (7.5YR 6/4) gravelly loam, brown (7.5YR 5/4) moist; weak medium subangular blocky structure that parts to fine granular; slightly hard, very friable, slightly sticky and slightly plastic; many fine and medium roots; 35 percent gravel; calcareous; moderately alkaline; diffuse wavy boundary. (3 to 10 inches thick)

C1ca—10 to 30 inches; pinkish white (7.5YR 8/2) very gravelly loam, pinkish gray (7.5YR 6/2) moist; massive; very hard, firm, slightly sticky and slightly plastic; few fine, medium and coarse roots; 45 percent gravel, 20 percent cobble; calcareous; moderately alkaline; gradual wavy boundary. (10 to 30 inches thick)

IIC2r—30 to 60 inches; pinkish white (7.5YR 8/2); marl; strongly cemented in places; hard layers are thin and discontinuous; 10 percent gravel, 5 percent cobble; calcareous.

The soils are typically calcareous to the surface. The A horizon has value of 5 or 6 dry and 3 to 5 moist and has chroma of 2 to 4 dry and moist. The control section (10 to 40 inches) has hue of 7.5YR or 10YR, value of 6 to 8 dry and 5 or 6 moist, and chroma of 2 to 4 dry and moist. Texture of the control section is very gravelly loam or very gravelly light clay loam. Clay content ranges from 18 to 35 percent. The content of gravel, cobble, and stone ranges from 35 to 80 percent. Reaction is mildly alkaline or moderately alkaline. Depth to soft or partially cemented marl ranges from 20 to 40 inches.

Scholle series

The Scholle series consists of deep, well drained soils that formed in cobbly alluvium from material of igneous origin. Scholle soils are on old terraces, mesas, and benches. Slopes range from 3 to 40 percent. Average annual precipitation is about 13 inches, and average annual air temperature is about 46 degrees F.

Scholle soils are similar to Potts and Progresso soils and are near Agua Fria, Saraton, and Kech soils. Potts soils have less than 15 percent gravel, cobble, and stone in the A horizon and in the B horizon. Progresso soils have less than 15 percent gravel, cobble, and stone and have sandstone at a depth of 20 to 40 inches. Agua Fria soils have more than 35 percent clay in the B horizon. Saraton soils have marl at a depth of 20 to 40 inches. Kech soils have sandstone bedrock at a depth of less than 20 inches.

Typical pedon of Scholle stony loam, 12 to 40 percent slopes, NW1/4 Sec. 7, T. 15 S., R. 91 W., in Delta County:

A1—0 to 4 inches; pinkish gray (7.5YR 6/2) stony loam, dark brown (7.5YR 4/2) moist; moderate medium and fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; few fine and medium roots; 15 percent gravel, cobble, and stone; calcareous; mildly alkaline; clear wavy boundary. (3 to 6 inches thick.)

B2t—4 to 10 inches; brown (7.5YR 5/4) gravelly clay loam, dark brown (7.5YR 4/4) moist; moderate medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few fine and very fine roots; 15 percent gravel, cobble, and stone; thin continuous clay films; calcareous; mildly alkaline; clear wavy boundary. (5 to 7 inches thick)

B3ca—10 to 20 inches; light brown (7.5YR 6/4) gravelly clay loam, brown (7.5YR 5/4) moist; weak medium subangular blocky structure; hard, firm, slightly sticky and slightly plastic; few fine and very fine roots; 30 percent gravel and cobble; thin patchy clay films; moderately alkaline; gradual wavy boundary. (8 to 12 inches thick)

Cca—20 to 60 inches; very pale brown (10YR 7/3) cobbly loam, pale brown (10YR 6/3) moist; massive; hard, friable, slightly sticky and nonplastic; 30 percent cobble and gravel increasing to about 40 percent in the lower part; calcareous; visible lime; moderately alkaline; gradual wavy boundary. (16 to 20 inches thick)

Reaction is mildly alkaline or moderately alkaline. The content of rock fragments in the control section ranges from 15 to 35 percent.

The A horizon has value of 5 or 6 dry and 4 or 5 moist and has chroma of 2 to 4 dry and moist. The B horizon has hue of 10YR or 7.5YR, value of 5 or 6 dry and 4 or 5 moist, and chroma of 3 or 4 dry and moist. Texture of this horizon is gravelly clay loam, and the content of clay ranges from 27 to 35 percent. Texture of the C horizon is cobbly loam, and the content of calcium carbonate equivalent ranges from 15 to 30 percent.

Shavano series

The Shavano series consists of moderately deep, well drained soils that formed in locally transported material that was weathered in place from sandstone and interbedded shale. Shavano soils are on uplands. Slopes range from 3 to 12 percent. Average annual precipitation is about 10 inches, and average annual air temperature is about 51 degrees F.

Shavano soils are similar to Lazear soils and are near Chipeta, Persayo, Billings, and Glenton soils. Lazear soils have sandstone bedrock at a depth of less than 20 inches. Chipeta and Persayo soils have soft calcareous shale at a depth of less than 20 inches. Billings and Glenton soils are deep and are stratified in the lower part of the profile.

Typical pedon of Shavano fine sandy loam, in an area of Shavano-Lazear complex, 3 to 12 percent slopes, .5 miles west of Highway 50 in SW1/4 Sec. 21, T. 4 S., R. 3 E., (Ute PM), in Delta County:

A1—0 to 3 inches; light brown (7.5YR 6/4) fine sandy loam, brown (7.5YR 5/4) moist; weak medium platy structure that parts to weak fine granular; soft, very friable, few fine and medium roots; 5 percent flat sandstone fragments; calcareous; moderately alkaline; clear smooth boundary. (2 to 4 inches thick)

AC—3 to 14 inches; light brown (7.5YR 6/4) fine sandy loam, brown (7.5YR 5/4) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few fine roots; 10 percent flat sandstone fragments; few white lime streaks; calcareous; moderately alkaline; gradual smooth boundary. (8 to 14 inches thick)

Cca—14 to 26 inches; pink (7.5YR 7/4) gravelly sandy clay loam, brown (7.5YR 5/4) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; 15 to 30 percent flat sandstone fragments with content increasing with depth; some visible secondary calcium carbonate; calcareous; moderately alkaline; clear wavy boundary. (10 to 22 inches thick)

R—26 inches; hard sandstone.

The soils are calcareous throughout, and reaction is moderately alkaline or strongly alkaline. The A horizon has value of 5 to 7 dry and 4 to 6 moist and has chroma of 2 to 4 dry and moist. The C horizon has hue of 7.5YR or 10YR, value of 5 to 7 dry and 4 to 6 moist, and chroma of 2 to 4 dry and moist. Texture of the C horizon ranges from fine sandy loam to sandy clay loam, and the content of clay ranges from 18 to 35 percent. The content of flat sandstone fragments ranges from 10 to 30 percent and increases with depth, and the content of carbonates ranges from 5 to 10 percent with some visible lime. Depth to sandstone and interbedded shale ranges from 20 to 40 inches.

Uffens series

The Uffens series consists of deep, well drained soils that formed in alkaline alluvium from varied origin. Uffens soils are on alluvial fans and low terraces. Slopes range from 0 to 5 percent. Average annual precipitation is about 9 inches, and average annual air temperature is about 49 degrees F.

Uffens soils are similar to Meeteetse soils and are near Glenton and Billings soils. Meeteetse soils have more than 35 percent clay in the B horizon. Billings and Glenton soils do not have columnar structure in the B horizon. They are stratified in the lower part of the C horizon.

Typical pedon of Uffens sandy loam, 0 to 5 percent slopes, NE1/4NW1/4 Sec. 35, T. 14 S., R. 98 W., in Delta County:

A2—0 to 3 inches; light gray (10YR 7/2) sandy loam, grayish brown (10YR 5/2) moist; weak very fine platy structure; soft, friable, few fine and medium roots; calcareous; strongly alkaline; abrupt wavy boundary. (1 to 4 inches thick)

B21tsa—3 to 7 inches; pinkish gray (7.5YR 6/2) sandy clay loam, brown (7.5YR 5/3) moist; moderate medium and fine columnar structure that parts to fine subangular blocky; friable, hard, slightly sticky and slightly plastic; few fine roots; thin discontinuous salt seams; thin continuous clay films; calcareous; very strongly alkaline; abrupt smooth boundary. (3 to 6 inches thick)

B22tsa—7 to 14 inches; pinkish gray (7.5YR 6/2) light sandy clay loam, brown (7.5YR 5/3) moist; weak medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; thin discontinuous salt seams; thin patchy clay films; calcareous; very strongly alkaline; abrupt smooth boundary. (4 to 10 inches thick)

C—14 to 60 inches; pinkish gray (7.5YR 6/2) sandy loam, brown (7.5YR 5/2) moist; massive; loose, very friable; small salt concretions visible; calcareous; strongly alkaline.

Reaction is strongly alkaline or very strongly alkaline in the control section. The solum ranges from 8 to 20 inches thick.

The A horizon has hue of 10YR, and reaction is moderately alkaline or strongly alkaline. The B2tsa horizon has hue of 7.5YR or 10YR, value of 6 or 7 dry and 4 or 5 moist, and chroma of 2 or 3 dry or moist. Texture of this horizon is sandy clay loam, and the content of clay ranges from 25 to 35 percent. The content of exchangeable sodium ranges from 15 to 30 percent. Texture of the C horizon is sandy loam, sandy clay loam, or loam; grading to sand with depth.

Utaline series

The Utaline series consists of deep, well drained soils that formed in stony and cobbly outwash alluvium from basalt. Utaline soils are on old high terraces, mesas, and fans. Slopes range from 3 to 60 percent. Average annual precipitation is about 12 inches, and average annual air temperature is about 50 degrees F.

Utaline soils are similar to Avalon and Saraton soils and are near Mesa, Billings, and Agua Fria soils. Avalon and Billings soils have less than 35 percent rock fragments in the control section. Saraton soils have marl at a depth of 20 to 40 inches. Mesa soils have a clay loam B horizon with less than 35 percent clay, and Agua Fria soils have more than 35 percent clay in the B horizon.

Typical pedon of Utaline stony loam, 3 to 30 percent slopes, about 500 feet south of the Delta-Mesa County line, SE1/4NW1/4 Sec. 13, T. 4 S., R. 3 E., in Delta County:

A1—0 to 4 inches; pink (7.5YR 7/4) stony loam, brown (7.5YR 5/4) moist; moderate medium granular structure; weak platy in upper 2 inches; 30 percent basalt stone and cobbles; moderately alkaline; clear smooth boundary. (3 to 6 inches thick)

ACca—4 to 9 inches; pink (7.5YR 7/4) very cobbly loam, brown (7.5YR 5/4) moist; weak medium subangular blocky structure; slightly hard, very friable; 50 percent basalt cobbles; some accumulation of visible secondary calcium carbonate as soft concretions; moderately alkaline; gradual wavy boundary. (3 to 6 inches thick)

C1ca—9 to 18 inches; pink (7.5YR 8/4) very cobbly loam, light brown (7.5YR 6/4) moist; massive; slightly hard, friable; 50 percent basalt cobbles; calcareous; moderately alkaline; gradual wavy boundary. (6 to 12 inches thick)

C2ca—18 to 40 inches; pinkish white (7.5YR 8/2) extremely cobbly loam, pink (7.5YR 7/4) moist; massive; slightly hard, friable; 75 percent basalt cobbles; much secondary calcium carbonate in finely divided form; moderately alkaline; diffuse wavy boundary. (15 to 30 inches thick)

C3ca—40 to 60 inches; pinkish gray (7.5YR 7/2) extremely cobbly loam, light brown (7.5YR 6/4) moist; massive; slightly hard, friable; 80 percent basalt cobbles; much accumulated calcium carbonate but less than in the horizon above.

The A horizon has value of 6 or 7 dry and 4 or 5 moist and has chroma of 3 or 4 moist and dry. The C horizon has hue of 7.5YR or 10YR, value of 6 to 8 dry and 5 to 7 moist, and chroma of 3 or 4 moist and dry. Reaction is moderately alkaline or strongly alkaline. The C horizon has more than 15 percent calcium carbonate in some places at a depth of 20 to 40 inches. The content of cobbles and stones ranges from 35 to 80 percent.

Work series

The Work series consists of deep, well drained soils that formed in reworked alluvium that was weathered from sandstone and interbedded shale. Work soils are on alluvial fans and valley-filling foot slopes. Slopes range from 3 to 25 percent. Average annual precipitation is about 17 inches, and average annual air temperature is about 44 degrees F.

Work soils are similar to Cerro and Absarokee soils and are near Radersburg, Delson, and Fughes soils. Cerro soils have a high COLE value, and deep wide cracks form when the soil is dry. Absarokee soils have sandstone bedrock at a depth of 20 to 40 inches. Radersburg soils have more than 35 percent rock frag-

ments in the B horizon. Delson and Fughes soils are noncalcareous in the C horizon. Fughes soils have a mollic epipedon that is more than 16 inches thick.

Typical pedon of Work loam, in an area of Absarokee loams, 6 to 25 percent slopes, Poison Springs Gulch, SW1/4 Sec. 22, T. 50 N., R. 7 W., in Montrose County:

A1—0 to 6 inches; dark brown (7.5YR 4/2) loam, very dark brown (7.5YR 2/2) moist; moderate medium granular structure; soft, friable, nonsticky and slightly plastic; common fine and very fine roots; 5 percent sandstone channers; neutral; clear smooth boundary. (4 to 7 inches thick)

B1t—6 to 13 inches; dark brown (7.5YR 4/2) clay loam, dark brown (7.5YR 3/2) moist; weak fine subangular blocky structure that parts to moderate fine granular; soft, friable, slightly sticky and slightly plastic; common fine and very fine roots; 5 percent sandstone channers; neutral; clear smooth boundary. (6 to 10 inches thick)

B21t—13 to 28 inches; brown (7.5YR 5/3) clay, dark brown (7.5YR 4/3) moist; moderate medium and fine angular blocky structure; very hard, firm, very sticky and plastic; few fine and very fine roots; 5 percent sandstone channers; moderate continuous films; neutral; gradual smooth boundary. (12 to 16 inches thick)

B22tca—28 to 34 inches; brown (7.5YR 5/3) clay, dark brown (7.5YR 4/3) moist; moderate medium subangular and angular blocky structure; very hard, firm, very sticky and plastic; 5 percent sandstone channers; thin continuous clay films; visible lime, calcareous; mildly alkaline; gradual wavy boundary. (4 to 8 inches thick)

B3ca—34 to 39 inches; light brown (7.5YR 6/3) clay loam, brown (7.5YR 5/3) moist; weak fine subangular blocky structure; hard, friable, sticky and plastic; thin patchy clay films; 10 percent sandstone channers; calcareous; mildly alkaline; gradual wavy boundary. (3 to 6 inches thick)

Cca—39 to 60 inches; very pale brown (10YR 7/3) channery loam, pale brown (10YR 6/3) moist; massive; hard, friable, sticky and plastic; 15 percent sandstone fragments; calcareous; moderately alkaline.

The mollic epipedon ranges from 10 to 16 inches thick and includes part of the argillic horizon. The A horizon has value of 4 or 5 dry and 2 or 3 moist and has chroma of 2 dry and moist. The B horizon has hue of 7.5YR or 10YR, value of 4 to 6 dry and 3 to 5 moist, and chroma of 2 or 3 dry and moist. Texture of the B horizon is clay loam or light clay, and the content of clay ranges from 35 to 45 percent. Reaction is neutral or mildly alkaline. Texture of the C horizon is loam or channery loam, and the content of flat sandstone fragments ranges from 10 to 20 percent.

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(3) United States Department of Agriculture. 1951. Soil survey manual. U.S. Dep. Agric. Handb. 18, 503 pp., illus. Supplements replacing pp. 173-188 issued May 1962

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Glossary

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alkali (sodic) soil. A soil having so high a degree of alkalinity (pH 8.5 or higher), or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Area reclaim. An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as—

	Inches
Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	More than 9

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bottom land. The normal flood plain of a stream, subject to frequent flooding.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Broad-base terrace. A ridge-type terrace built to control erosion by diverting runoff along the contour at a nonscouring velocity. The terrace is 10 to 20 inches high and 15 to 30 feet wide and has gently sloping sides, a rounded crown, and a dish-shaped channel along the upper side. It may be nearly level or have a grade toward one or both ends.

Calcareous soil. A soil containing enough calcium carbonate (commonly with magnesium carbonate) to effervesce (fizz) visibly when treated with cold, dilute hydrochloric acid. A soil having measurable amounts of calcium carbonate or magnesium carbonate.

Caliche. A more or less cemented deposit of calcium carbonate in soils of warm-temperate, subhumid to arid areas. Caliche occurs as soft, thin layers in the soil or as hard, thick beds just beneath the solum, or it is exposed at the surface by erosion.

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity, but is more precise in meaning.

Catsteps. Very small, irregular terraces on steep hillsides, especially in pasture, formed by the trampling of cattle or the slippage of saturated soil.

Channery soil. A soil, that is, by volume, more than 15 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches along the longest axis. A single piece is called a fragment.

Chiseling. Tillage with an implement having one or more soil-penetrating points that loosen the subsoil and bring clods to the surface. A form of emergency tillage to control soil blowing.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coat, clay skin.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Climax vegetation. The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

Coarse fragments. Mineral or rock particles up to 3 inches (2 millimeters to 7.5 centimeters) in diameter.

Coarse textured (light textured) soil. Sand or loamy sand.

Cobblestone (or cobble). A rounded or partly rounded fragment of rock 3 to 10 inches (7.5 to 25 centimeters) in diameter.

Colluvium. Soil material, rock fragments, or both moved by creep, slide, or local wash and deposited at the bases of steep slopes.

Complex slope. Irregular or variable slope. Planning or constructing terraces, diversions, and other water-control measures is difficult.

Compressible. Excessive decrease in volume of soft soil under load.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is 40 or 80 inches (1 or 2 meters).

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cutbanks cave. Unstable walls of cuts made by earth-moving equipment. The soil sloughs easily.

Decreasers. The most heavily grazed climax range plants. Because they are the most palatable, they are the first to be destroyed by overgrazing.

Deferred grazing. A delay in grazing until range plants have reached a specified stage of growth. Grazing is deferred in order to increase the vigor of forage and to allow desirable plants to produce seed. Contrasts with continuous grazing and rotation grazing.

Delta. An alluvial deposit, commonly triangular in shape, formed largely beneath water and deposited at the mouth of a river or stream.

Depth to rock. Bedrock at a depth that adversely affects the specified use.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically for long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients, as for example in "hillpeats" and "climatic moors."

Drainage, surface. Runoff, or surface flow of water, from an area.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Erosion. The wearing away of the land surface by running water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes a bare surface.

Erosion pavement. A layer of gravel or stones that remains on the ground surface after fine particles are removed by wind or water. Desert pavements result from wind erosion in arid areas.

Excess alkali. Excess exchangeable sodium. The resulting poor physical properties restrict the growth of plants.

Excess fines. Excess silt and clay. The soil does not provide a source of gravel or sand for construction purposes.

Excess lime. Excess carbonates. Excessive carbonates, or lime, restrict the growth of some plants.

Excess salts. Excess water soluble salts. Excessive salts restrict the growth of most plants.

Fallow. Cropland left idle in order to restore productivity through accumulation of moisture. Summer fallow is common in regions of limited rainfall where cereal grains are grown. The soil is tilled for at least one growing season for weed control and decomposition of plant residue.

Fast intake. The rapid movement of water into the soil.

Favorable. Favorable soil features for the specified use.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity*.

Fine textured (heavy textured) soil. Sandy clay, silty clay, and clay.

First bottom. The normal flood plain of a stream, subject to frequent or occasional flooding.

Flagstone. A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist, 6 to 15 inches (15 to 37.5 centimeters) long.

Flooding. The temporary covering of soil with water from overflowing streams, runoff from adjacent slopes, and tides. Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *occasional* that it occurs on an average of once or less in 2 years; and *frequent* that it occurs on an average of more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months; *November-May*, for example, means that flooding can occur during the period November through May. Water standing for short periods after rainfall or commonly covering swamps and marshes is not considered flooding.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Foot slope. The inclined surface at the base of a hill.

Forage. Plant material used as feed by domestic animals. Forage can be grazed or cut for hay.

Forb. Any herbaceous plant not a grass or a sedge.

Fragipan. A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Frost action. Freezing and thawing of soil moisture. Frost action can damage structures and plant roots.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Glacial drift (geology). Pulverized and other rock material transported by glacial ice and then deposited. Also the assorted and unassorted material deposited by streams flowing from glaciers.

Glacial outwash (geology). Gravel, sand, and silt, commonly stratified, deposited by melt water as it flows from glacial ice.

Glacial till (geology). Unassorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Gleyed soil. A soil having one or more neutral gray horizons as a result of waterlogging and lack of oxygen. The term "gleyed" also designates gray horizons and horizons having yellow and gray mottles as a result of intermittent waterlogging.

Graded stripcropping. Growing crops in strips that grade toward a protected waterway.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.5 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material from 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.5 centimeters) in diameter.

Green manure (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table, which is the upper limit of saturation.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Gypsum. Hydrous calcium sulphate.

Habitat. The natural abode of a plant or animal; refers to the kind of environment in which a plant or animal normally lives, as opposed to the range or geographical distribution.

Hardpan. A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. The major horizons of mineral soil are as follows:

O horizon.—An organic layer, fresh and decaying plant residue, at the surface of a mineral soil.

A horizon.—The mineral horizon, formed or forming at or near the surface, in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon most of which was originally part of a B horizon.

A2 horizon.—A mineral horizon, mainly a residual concentration of sand and silt high in content of resistant minerals as a result of the loss of silicate clay, iron, aluminum, or a combination of these.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of change from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics caused (1) by accumulation of clay, sesquioxides, humus, or a combination of these; (2) by prismatic or blocky structure; (3) by redder or browner colors than those in the A horizon; or (4) by a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil lacks a B horizon, the A horizon alone is the solum.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the A or B horizon. The material of a C horizon may be either like or unlike that from which the solum is presumed to have formed. If the material is known to differ from that in the solum the Roman numeral II precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

Hummocky. Refers to a landscape of hillocks, separated by low sags, having sharply rounded tops and steep sides. Hummocky relief resembles rolling or undulating relief, but the tops of ridges are narrower and the sides are shorter and less even.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Increasers. Species in the climax vegetation that increase in amount as the more desirable plants are reduced by close grazing. Increasers commonly are the shorter plants and the less palatable to livestock.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Invaders. On range, plants that encroach into an area and grow after the climax vegetation has been reduced by grazing. Generally, invader plants are those that follow disturbance of the surface.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are—

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Landslide. The rapid downhill movement of a mass of soil and loose rock generally when wet or saturated. The speed and distance of movement, as well as the amount of soil and rock material, vary greatly.

Large stones. Rock fragments 10 inches (25 centimeters) or more across. Large stones adversely affect the specified use.

Leaching. The removal of soluble material from soil or other material by percolating water.

Light textured soil. Sand and loamy sand.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind.

Low strength. Inadequate strength for supporting loads.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Metamorphic rock. Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement. Nearly all such rocks are crystalline.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is greater than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Moderately coarse textured (moderately light textured) soil. Sandy loam and fine sandy loam.

Moderately fine textured (moderately heavy textured) soil. Clay loam, sandy clay loam, and silty clay loam.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Munsell notation. A designation of color by degrees of the three single variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value between 6.6 and 7.3.

Nutrient, plant. Any element taken in by a plant, essential to its growth, and used by it in the production of food and tissue. Plant nutrients are nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, zinc, and perhaps other elements obtained from the soil; and carbon, hydrogen, and oxygen obtained largely from the air and water.

Pan. A compact, dense layer in a soil. A pan impedes the movement of water and the growth of roots. The word "pan" is commonly combined with other words that more explicitly indicate the nature of the layer; for example, *hardpan, fragipan, claypan, plowpan,* and *traffic pan*.

Parent material. The great variety of unconsolidated organic and mineral material in which soil forms. Consolidated bedrock is not yet parent material by this concept.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly. The slow movement of water through the soil adversely affecting the specified use.

Permeability. The quality that enables the soil to transmit water or air, measured as the number of inches per hour that water moves through the soil. Terms describing permeability are *very slow* (less than 0.06 inch), *slow* (0.06 to 0.20 inch), *moderately slow* (0.2 to 0.6 inch), *moderate* (0.6 to 2.0 inches), *moderately rapid* (2.0 to 6.0 inches), *rapid* (6.0 to 20 inches), and *very rapid* (more than 20 inches).

pH value. (See Reaction, soil). A numerical designation of acidity and alkalinity in soil.

Piping. Moving water of subsurface tunnels or pipelike cavities in the soil.

Pitting. Formation of pits as a result of the melting of ground ice after the removal of plant cover.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from a semisolid to a plastic state.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Polypedon. A volume of soil having properties within the limits of a soil series, the lowest and most homogeneous category of soil taxonomy. A "soil individual."

Poorly graded. Refers to soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Poor outlets. Surface or subsurface drainage outlets difficult or expensive to install.

Productivity (soil). The capability of a soil for producing a specified plant or sequence of plants under a specified system of management. Productivity is measured in terms of output, or harvest, in relation to input.

Range (or rangeland). Land that, for the most part, produces native plants suitable for grazing by livestock; includes land supporting some forest trees.

Range condition. The health or productivity of forage plants on a given range, in terms of the potential productivity under normal climate and the best prac-

tical management. Condition classes generally recognized are—*excellent, good, fair,* and *poor.* The classification is based on the percentage of original, or assumed climax vegetation on a site, as compared to what has been observed to grow on it when well managed.

Range site. An area of range where climate, soil, and relief are sufficiently uniform to produce a distinct kind and amount of native vegetation.

Reaction, soil. The degree of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	pH
Extremely acid	Below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Regolith. The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock. Soil scientists regard as soil only the part of the regolith that is modified by organisms and other soil-building forces. Most engineers describe the whole regolith, even to a great depth, as "soil."

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered, or partly weathered mineral material that accumulates over disintegrating rock.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth. Shallow root zone. The soil is shallow over a layer that greatly restricts roots. See Root zone.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged in stream channels from a drainage area. The water that flows off the land surface without sinking in is called surface runoff; that which enters the ground before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Saline-alkali soil. A soil that contains a harmful concentration of salts and exchangeable sodium; contains harmful salts and is strongly alkaline; or contains harmful salts and exchangeable sodium and is very strongly alkaline. The salts, exchangeable sodium, and alkaline reaction are in the soil in such location that growth of most crop plants is less than normal.

Saline soil. A soil containing soluble salts in an amount that impairs growth of plants. A saline soil does not contain excess exchangeable sodium.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-size particles.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Seepage. The rapid movement of water through the soil. Seepage adversely affects the specified use.

Sequum. A sequence consisting of an illuvial horizon and the overlying eluvial horizon.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and runoff water.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silica. A combination of silicon and oxygen. The mineral form is called quartz.

Silica-alumina ratio. The molecular ratio of silica to alumina in soil, clay, or any alumino-silicate mineral.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

Slick spot. Locally, a small area of soil having a puddled, crusted, or smooth surface and an excess of exchangeable sodium. The soil is generally silty or clayey, is slippery when wet, and is low in productivity.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by

100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slow intake. The slow movement of water into the soil.

Slow refill. The slow filling of ponds, resulting from restricted permeability in the soil.

Small stones. Rock fragments 3 to 10 inches (7.5 to 25 centimeters) in diameter. Small stones adversely affect the specified use.

Sodicity. The degree to which a soil is affected by exchangeable sodium. Sodicity is expressed as a sodium adsorption ratio (SAR) of a saturation extract, or the ratio of Na@ to Ca@@ Mg@@. The degrees of sodicity are—

	SAR
Slight	Less than 13:1
Moderate	13-30:1
Strong	More than 30:1

Soil. A natural, three-dimensional body at the earth's surface that is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows: *very coarse sand* (2.0 millimeters to 1.0 millimeter); *coarse sand* (1.0 to 0.5 millimeter); *medium sand* (0.5 to 0.25 millimeter); *fine sand* (0.25 to 0.10 millimeter); *very fine sand* (0.10 to 0.05 millimeter); *silt* (0.005 to 0.002 millimeter); and *clay* (less than 0.002 millimeter).

Solodized soil. A formerly alkali (sodic) soil that has been leached so that it has become acid and has a thick, gray upper layer over an acid, blocky B horizon. The resulting soil may be termed a Soloth.

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in mature soil consists of the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and other plant and animal life characteristics of the soil are largely confined to the solum.

Stone line. A concentration of coarse fragments in soils that generally marks an old weathering surface. In a cross section, the line may be one fragment or more thick. The line generally overlies material that weathered in place and marks the top of a paleosol. It is ordinarily overlain by recent sediment of variable thickness.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stratified. Arranged in strata, or layers. The term refers to geologic material. Layers in soils that result from the processes of soil formation are called horizons; those inherited from the parent material are called strata.

Stripcropping. Growing crops in a systematic arrangement of strips or bands which provide vegetative barriers to wind and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates that are separated from adjoining aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular. Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil, or partly worked into the soil, to provide protection from soil blowing and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Tilling a soil below normal plow depth, ordinarily to shatter a hardpan or claypan.

Substratum. The part of the soil below the solum.

Subsurface layer. Technically, the A2 horizon. Generally refers to a leached horizon lighter in color and lower in content of organic matter than the overlying surface layer.

Summer fallow. The tillage of uncropped land during the summer to control weeds and allow storage of moisture in the soil for the growth of a later crop. A practice common in semiarid regions, where annual precipitaion is not enough to produce a crop every year. Summer fallow is frequently practiced before planting winter grain.

Surface soil. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea. A stream terrace is frequently called a second bottom, in contrast with a flood plain, and is seldom subject to overflow. A marine terrace, generally wide, was deposited by the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt, silt loam, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer. Otherwise suitable soil material too thin for the specified use.

Tilth, soil. The condition of the soil, especially the soil structure, as related to the growth of plants. Good tilth refers to the friable state and is associated with high noncapillary porosity and stable structure. A soil in poor tilth is nonfriable, hard, nonaggregated, and difficult to till.

Toe slope. The outermost inclined surface at the base of a hill; part of a foot slope.

Topsoil (engineering). Presumably a fertile soil or soil material, or one that responds to fertilization, ordinarily rich in organic matter, used to topdress roadbanks, lawns, and gardens.

Trace elements. The chemical elements in soils, in only extremely small amounts, essential to plant growth. Examples are zinc, cobalt, manganese, copper, and iron.

Tuff. A compacted deposit 50 percent or more volcanic ash and dust.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Unstable fill. Risk of caving or sloughing in banks of fill material.

Valley fill. In glaciated regions, material deposited in stream valleys by glacial melt water. In nonglaciated regions, alluvium deposited by heavily loaded streams emerging from hills or mountains and spreading sediments onto the lowland as a series of adjacent alluvial fans.

Variegation. Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

Water table. The upper limit of the soil or underlying rock material that is wholly saturated with water.
Water table, apparent. A thick zone of free water in the soil. An apparent water table is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil.
Water table, artesian. A water table under hydrostatic head, generally beneath an impermeable layer. When this layer is penetrated, the water level rises in an uncased borehole.
Water table, perched. A water table standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

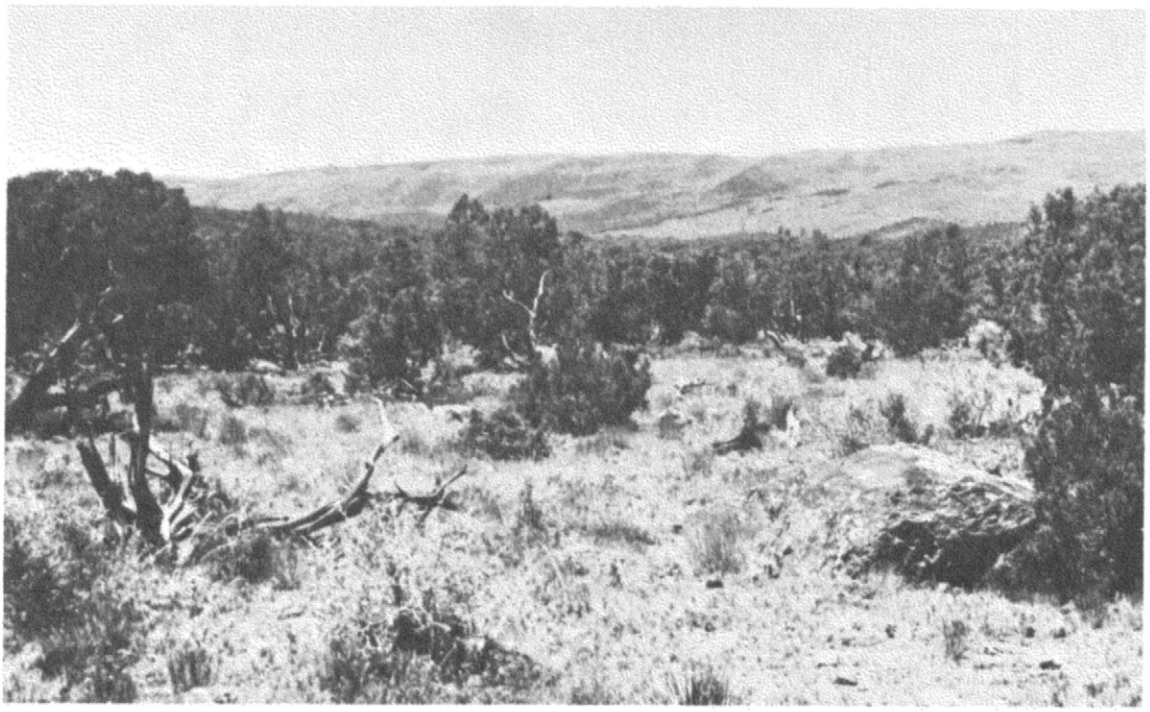
Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to a soil or soil material consisting of particles well distributed over a wide range in size or diameter. Such a soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Illustrations

Figure 1.—Horseback riding and pack trips are among the many recreational activities available to residents and visitors in the survey area. This area of Breece loam, 1 to 6 percent slopes, is used for irrigated hay.



Figures 2.—Pinyon and juniper have encroached into this area of Agua Fria stony loam, 3 to 12 percent slopes, in rangeland. This soil has potential for orchards.

Figure 3.—At center is a flooded area of Haplaquolls, flooded, along Smith Fork.

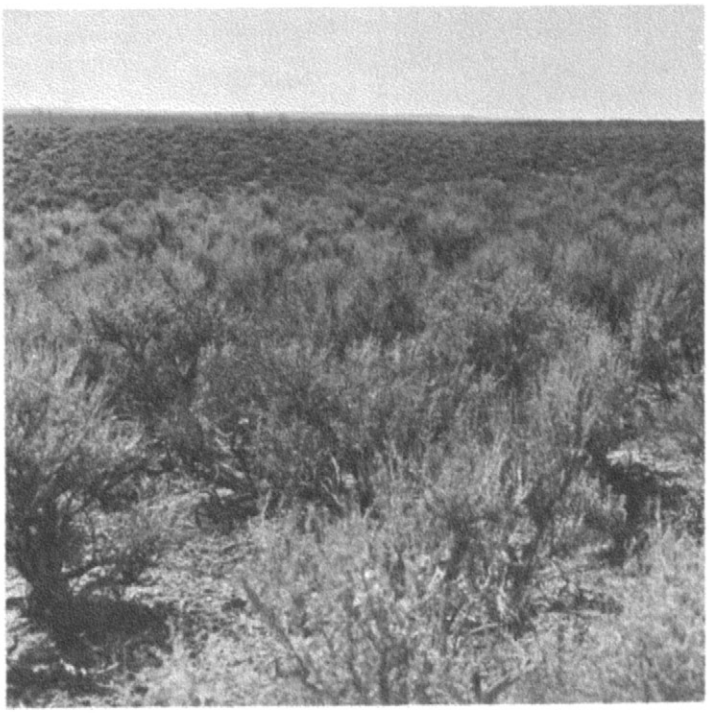
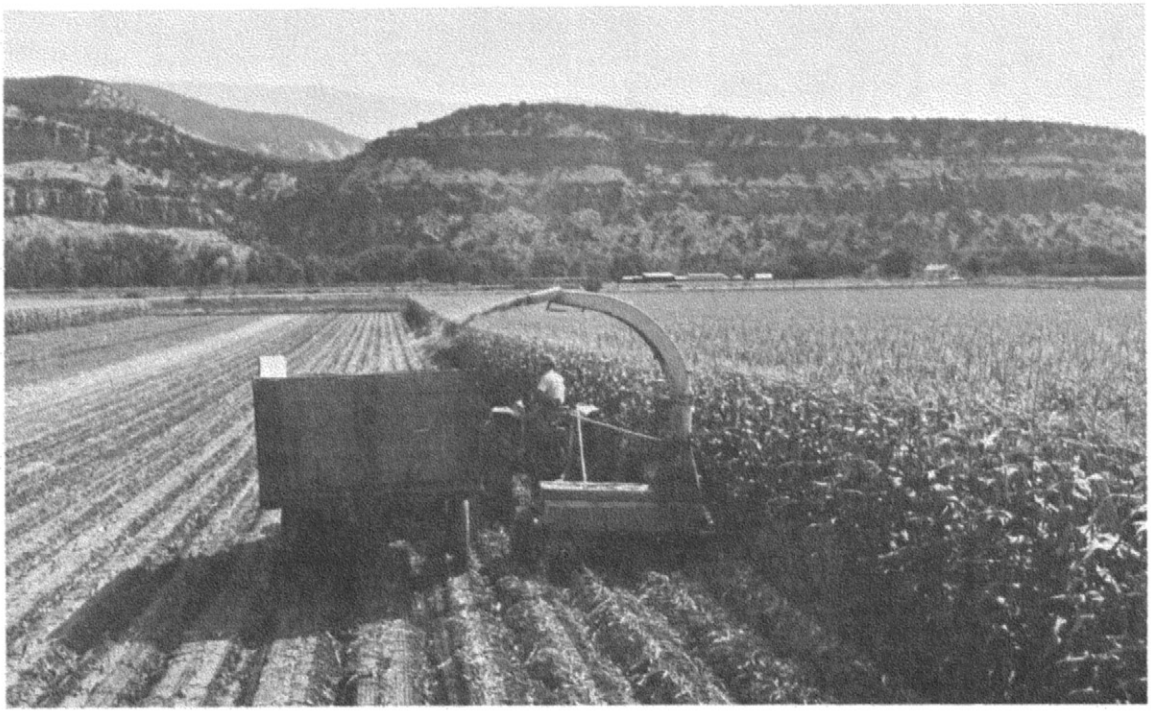


Figure 4.—Areas of Kech-Progresso loams, 3 to 15 percent slopes, are used for winter range by mule deer.



Figúre 5.—Corn for silage is being harvested in this area of Mesa loam, 0 to 3 percent slopes. In the background is an area of Torriorthents-Rock outcrop, sandstone, complex.

Figure 6.—Range in this area of Shavano-Lazear complex, 3 to 12 percent slopes, is in fair condition.

Figure 7.—At left is a sparsely vegetated area of Torriorthents-Rock outcrop, sandstone, complex. Glenton soils are in the narrow valleys.

Figure 8.—This is a typical area of Utaline stony loam, 3 to 30 percent slopes, in Stony Saltdesert range site.

TABLES

TABLE 1.--TEMPERATURE AND PRECIPITATION DATA

[Data recorded in the period 1951 to 1973 at Cedaredge, Colorado]

Month	Temperature						Precipitation				
				2 years in 10 will have--				2 years in 10 will have--			
	Average daily maximum	Average daily minimum	Average daily	Maximum temperature higher than--	Minimum temperature lower than--	Average number of growing degree days[1]	Average	Less than--	More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F		In	In	In		In
January----	38.9	16.1	27.5	56	-7	19	.81	.24	1.26	3	9.3
February---	44.2	20.3	32.3	62	-3	27	.77	.26	1.18	3	7.8
March------	51.7	25.4	38.5	72	6	79	.86	.31	1.29	3	7.4
April------	61.5	32.8	47.1	78	16	225	.90	.46	1.26	3	2.6
May--------	72.3	41.6	57.0	88	26	527	.96	.35	1.44	3	.4
June-------	81.7	49.5	65.6	94	35	768	.81	.20	1.30	2	.0
July-------	87.6	56.1	71.9	96	46	989	.89	.31	1.35	3	.0
August-----	84.9	54.1	69.5	93	42	915	1.36	.72	1.88	4	.0
September--	77.4	45.8	61.6	91	30	648	1.20	.28	1.91	3	.0
October----	65.7	36.0	50.9	81	19	344	1.40	.45	2.21	3	.9
November---	49.7	25.3	37.5	69	5	69	.94	.57	1.26	3	4.9
December---	39.5	17.4	28.5	58	-4	10	1.02	.56	1.38	4	10.2
Year-----	62.9	35.0	49.0	97	-11	4,620	11.92	9.80	13.92	37	43.5

[1]A growing degree day is an index of the amount of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (40° F.).

TABLE 2.--TEMPERATURE AND PRECIPITATION DATA

[Data recorded in the period 1951 to 1972 at Delta, Colorado]

Month	Temperature						Precipitation				
				2 years in 10 will have--				2 years in 10 will have--			
	Average daily maximum	Average daily minimum	Average daily	Maximum temperature higher than--	Minimum temperature lower than--	Average number of growing degree days[1]	Average	Less than--	More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F		In	In	In		In
January----	40.1	13.5	26.8	60	-10	20	.33	.08	.51	1	3.7
February---	47.8	18.3	33.0	68	-3	28	.36	.08	.58	1	2.8
March------	57.0	23.9	40.5	78	5	101	.39	.08	.62	2	1.4
April------	67.7	32.0	49.9	85	16	302	.55	.19	.83	2	.2
May--------	78.4	41.2	59.8	94	26	614	.56	.17	.86	2	.0
June-------	87.6	48.3	68.0	100	36	840	.51	.12	.81	1	.0
July-------	93.2	54.2	73.8	102	42	1,048	.61	.24	.90	2	.0
August-----	89.5	52.9	71.2	100	40	967	1.04	.44	1.51	3	.0
September--	81.6	43.5	62.6	95	29	678	.92	.17	1.49	3	.0
October----	69.2	33.6	51.4	85	18	353	1.13	.25	1.84	3	.3
November---	52.4	22.7	37.6	71	3	67	.56	.31	.76	2	2.5
December---	40.1	14.3	27.2	59	-8	12	.49	.20	.71	2	4.6
Year-----	67.1	33.2	50.2	102	-15	5,030	7.45	5.55	9.18	24	15.5

[1]A growing degree day is an index of the amount of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (40° F.).

TABLE 3.--TEMPERATURE AND PRECIPITATION DATA

[Data recorded in the period 1957 to 1974 at Paonia, Colorado]

Month	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average daily	2 years in 10 will have-- Maximum temperature higher than--	2 years in 10 will have-- Minimum temperature lower than--	Average number of growing degree days[1]	Average	2 years in 10 will have-- Less than--	2 years in 10 will have-- More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F		In	In	In		In
January----	38.5	11.4	25.0	58	-17	12	1.15	.39	1.75	4	12.5
February---	45.4	18.8	32.1	64	-3	38	1.10	.40	1.66	4	7.3
March------	53.3	25.0	39.2	74	4	92	1.27	.55	1.85	4	7.7
April------	62.3	31.6	47.0	80	16	223	1.47	.84	1.98	4	3.7
May--------	73.7	40.3	57.1	88	25	530	1.24	.46	1.85	4	.2
June-------	82.8	48.5	65.7	94	35	771	.89	.26	1.39	3	.0
July-------	88.5	55.0	71.8	96	45	986	1.06	.39	1.60	3	.0
August-----	86.4	53.7	70.1	95	42	933	1.46	.64	2.12	4	.0
September--	77.7	45.0	61.4	91	29	642	1.53	.62	2.25	5	.0
October----	67.2	35.1	51.2	82	18	354	1.54	.57	2.32	4	.7
November---	52.5	24.7	38.6	71	8	69	1.22	.70	1.64	4	3.0
December---	41.3	14.9	28.1	62	-9	10	1.56	.87	2.12	5	15.6
Year-----	64.1	33.7	48.9	97	-17	4,660	15.49	13.09	17.81	48	50.7

[1]A growing degree day is an index of the amount of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (40° F.).

TABLE 4.--FREEZE DATES IN SPRING AND FALL

[Data recorded in the period 1951 to 1973 at Cedaredge, Colorado]

Probability	Minimum temperature		
	24°F. or lower	28°F. or lower	32°F. or lower
Last freezing temperature in spring:			
1 year in 10 later than--	May 4	May 11	June 4
2 years in 10 later than--	April 28	May 6	May 29
5 years in 10 later than--	April 18	April 28	May 17
First freezing temperature in fall:			
1 year in 10 earlier than--	October 15	September 30	September 18
2 years in 10 earlier than--	October 20	October 5	September 24
5 years in 10 earlier than--	October 29	October 16	October 4

TABLE 5.--FREEZE DATES IN SPRING AND FALL

[Data recorded in the period 1951 to 1972 at Delta, Colorado]

Probability	Minimum temperature		
	24°F. or lower	28°F. or lower	32°F. or lower
Last freezing temperature in spring:			
1 year in 10 later than--	May 3	May 14	June 3
2 years in 10 later than--	April 28	May 10	May 27
5 years in 10 later than--	April 20	May 1	May 14
First freezing temperature in fall:			
1 year in 10 earlier than--	October 6	September 28	September 12
2 years in 10 earlier than--	October 12	October 3	September 18
5 years in 10 earlier than--	October 24	October 13	September 28

TABLE 6.--FREEZE DATES IN SPRING AND FALL

[Data recorded in the period 1957 to 1974 at Paonia, Colorado]

Probability	Minimum temperature		
	24°F. or lower	28°F. or lower	32°F. or lower
Last freezing temperature in spring:			
1 year in 10 later than--	May 3	May 17	June 2
2 years in 10 later than--	April 28	May 13	May 27
5 years in 10 later than--	April 20	May 4	May 15
First freezing temperature in fall:			
1 year in 10 earlier than--	October 12	September 30	September 19
2 years in 10 earlier than--	October 17	October 6	September 24
5 years in 10 earlier than--	October 28	October 17	October 6

TABLE 7.--GROWING SEASON LENGTH

[Data recorded in the period 1951 to 1973 at Cedaredge, Colorado]

Probability	Daily minimum temperature during growing season		
	Higher than 24°F.	Higher than 28°F.	Higher than 32°F.
	Days	Days	Days
9 years in 10	170	151	114
8 years in 10	178	158	123
5 years in 10	193	170	139
2 years in 10	208	182	156
1 year in 10	216	189	164

TABLE 8.--GROWING SEASON LENGTH

[Data recorded in the period 1951 to 1972 at Delta, Colorado]

Probability	Daily minimum temperature during growing season		
	Higher than 24°F.	Higher than 28°F.	Higher than 32°F.
	Days	Days	Days
9 years in 10	160	141	108
8 years in 10	169	149	117
5 years in 10	186	164	136
2 years in 10	203	179	154
1 year in 10	212	187	164

TABLE 9.--GROWING SEASON LENGTH

[Data recorded in the period 1957 to 1974 at Paonia, Colorado]

Probability	Daily minimum temperature during growing season		
	Higher than 24°F.	Higher than 28°F.	Higher than 32°F.
	Days	Days	Days
9 years in 10	167	141	116
8 years in 10	175	149	126
5 years in 10	190	165	143
2 years in 10	206	180	161
1 year in 10	214	188	170

TABLE 10.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Delta County	Gunnison County	Montrose County	Total--	
					Area	Extent
		Acres	Acres	Acres	Acres	Pct
1	Absarokee loam, 3 to 12 percent slopes	0	0	13,380	13,380	2.0
2	Absarokee-Work loams, 6 to 25 percent slopes	2,680	980	360	4,020	0.6
3	Agua Fria stony loam, 3 to 12 percent slopes	13,420	0	0	13,420	2.1
4	Agua Fria stony loam, 12 to 25 percent slopes	7,090	0	0	7,090	1.1
5	Agua Fria clay loam, 1 to 6 percent slopes	13,650	0	0	13,650	2.1
6	Apishapa silty clay loam, 0 to 5 percent slopes	2,560	0	1,950	4,510	0.7
7	Aquic Natrargids, saline	1,000	0	0	1,000	0.2
8	Ascalon sandy loam, 3 to 10 percent slopes	1,880	0	0	1,880	0.3
9	Avalon loam, 0 to 3 percent slopes	600	0	0	600	0.1
10	Avalon loam, 3 to 6 percent slopes	2,520	0	0	2,520	0.4
11	Badland	26,270	0	9,430	35,700	5.4
12	Beenom-Absarokee loams, 5 to 20 percent slopes	360	80	17,210	17,650	2.7
13	Beenom-Absarokee association, 20 to 60 percent slopes	3,200	2,600	9,100	14,900	2.3
14	Billings silty clay loam, 0 to 3 percent slopes	3,680	0	40	3,720	0.6
15	Billings silty clay loam, 3 to 6 percent slopes	2,360	0	1,160	3,520	0.5
16	Billings silty clay loam, gullied, 0 to 6 percent slopes	2,840	0	0	2,840	0.4
17	Breece loam, 1 to 6 percent slopes	0	910	0	910	0.1
18	Bulkley clay loam, 12 to 25 percent slopes	360	740	0	1,100	0.2
19	Bulkley clay loam, 25 to 65 percent slopes	800	4,180	0	4,980	0.8
20	Cerro loam, 1 to 6 percent slopes	1,680	0	1,320	3,000	0.5
21	Cerro loam, 6 to 12 percent slopes	3,120	0	1,280	4,400	0.7
22	Cerro stony loam, 10 to 35 percent slopes	7,330	0	840	8,170	1.2
23	Chipeta silty clay, 3 to 30 percent slopes	5,240	0	640	5,880	0.9
24	Cliffdown gravelly loam, 0 to 12 percent slopes	1,800	0	0	1,800	0.3
25	Cochetopa stony loam, 10 to 40 percent slopes	12,730	2,180	1,360	16,270	2.5
26	Colona silty clay loam, 1 to 6 percent slopes	3,800	0	360	4,160	0.6
27	Colona silty clay loam, 6 to 12 percent slopes	5,000	80	2,150	7,230	1.1
28	Colona silty clay loam, 12 to 40 percent slopes	440	0	560	1,000	0.1
29	Cryoborolls, very stony	280	4,160	0	4,440	0.7
30	Curecanti loam, 3 to 15 percent slopes	80	580	0	660	0.1
31	Curecanti stony loam, 3 to 30 percent slopes	0	1,320	0	1,320	0.2
32	Delson loam, 3 to 12 percent slopes	1,600	0	0	1,600	0.2
33	Delson stony loam, 3 to 20 percent slopes	15,900	1,770	680	18,350	2.8
34	Delson very stony loam, 20 to 60 percent slopes	22,920	450	2,390	25,760	3.9
35	Fluvaquents, flooded	2,920	540	560	4,020	0.6
36	Fluvents, flooded	600	330	320	1,250	0.2
37	Fughes loam, 5 to 15 percent slopes	600	2,890	520	4,010	0.6
38	Fughes loam, 15 to 25 percent slopes	1,200	3,730	0	4,930	0.8
39	Fughes loam, 25 to 65 percent slopes	2,480	4,760	0	7,240	1.1
40	Fughes stony loam, 3 to 30 percent slopes	1,360	5,010	1,840	8,210	1.3
41	Fughes-Curecanti stony loams, 10 to 40 percent slopes	2,680	7,930	0	10,610	1.6
42	Glenton fine sandy loam, 0 to 3 percent slopes	2,880	0	0	2,880	0.4
43	Glenton loam, 3 to 6 percent slopes	720	0	480	1,200	0.2
44	Gullied land	3,040	0	1,400	4,440	0.7
45	Haplaquolls, flooded	1,600	0	0	1,600	0.2
46	Kech-Progresso loams, 3 to 15 percent slopes	12,250	0	2,640	14,890	2.3
47	Kech-Rock outcrop complex, 10 to 40 percent slopes	23,160	0	6,750	29,910	4.6
48	Killpack silty clay loam, 3 to 12 percent slopes	2,400	0	0	2,400	0.4
49	Lazear-Rock outcrop complex, 3 to 30 percent slopes	10,690	0	2,040	12,730	1.9
50	Limon silty clay loam, 0 to 3 percent slopes	600	0	0	600	0.1
51	Limon silty clay loam, 3 to 6 percent slopes	1,360	0	0	1,360	0.2
52	Meeteetse stony loam, 3 to 20 percent slopes	8,930	0	0	8,930	1.4
53	Mesa loam, 0 to 3 percent slopes	3,080	0	0	3,080	0.5
54	Mesa loam, 3 to 6 percent slopes	4,680	0	120	4,800	0.7
55	Mesa-Utaline stony loams, 3 to 12 percent slopes	4,760	0	0	4,760	0.7
56	Midway-Gaynor silty clay loams, 10 to 40 percent slopes	12,810	410	2,000	15,220	2.3
57	Northwater loam, 5 to 25 percent slopes	160	1,030	80	1,270	0.2
58	Northwater cobbly loam, 25 to 65 percent slopes	400	2,880	480	3,760	0.6
59	Persayo silty clay loam, 12 to 35 percent slopes	4,280	0	640	4,920	0.8
60	Potts loam, 1 to 6 percent slopes	320	0	600	920	0.1
61	Progresso loam, 3 to 6 percent slopes	3,600	0	320	3,920	0.6
62	Progresso loam, 6 to 12 percent slopes	3,920	0	3,110	7,030	1.1
63	Progresso-Potts association, 1 to 6 percent slopes	3,360	0	480	3,840	0.6
64	Radersburg loam, 6 to 12 percent slopes	360	0	840	1,200	0.2
65	Radersburg cobbly loam, 10 to 35 percent slopes	1,680	160	600	2,440	0.4
66	Razor silty clay loam, 3 to 12 percent slopes	5,160	160	920	6,240	1.0
67	Rock outcrop	28,810	210	8,230	37,250	5.7
68	Saraton gravelly loam, 3 to 12 percent slopes	6,090	0	0	6,090	0.9

TABLE 10.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

TABLE 10.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--Continued

Map symbol	Soil name	Delta County	Gunnison County	Montrose County	Total-- Area	Total-- Extent
		Acres	Acres	Acres	Acres	Pct
69	Saraton stony loam, 3 to 20 percent slopes	2,760	0	0	2,760	0.4
70	Saraton-Agua Fria complex, 20 to 50 percent slopes	33,970	250	520	34,740	5.3
71	Scholle stony loam, 3 to 12 percent slopes	800	0	40	840	0.1
72	Scholle stony loam, 12 to 40 percent slopes	1,000	0	320	1,320	0.2
73	Shavano-Lazear complex, 3 to 12 percent slopes	8,770	0	40	8,810	1.3
74	Torriorthents-Haplargids complex, very stony	1,160	450	400	2,010	0.3
75	Torriorthents-Rock outcrop, sandstone, complex	40,260	9,850	13,820	63,930	9.7
76	Torriorthents-Rock outcrop, shale, complex	11,730	80	2,840	14,650	2.2
77	Uffens sandy loam, 0 to 5 percent slopes	1,080	0	0	1,080	0.2
78	Utaline sandy loam, 3 to 12 percent slopes	6,450	0	0	6,450	1.0
79	Utaline stony loam, 3 to 30 percent slopes	5,120	0	0	5,120	0.8
80	Utaline-Torriorthents complex	25,170	0	160	25,330	3.9
81	Work loam, 3 to 6 percent slopes	40	0	1,240	1,280	0.2
82	Work loam, 6 to 12 percent slopes	640	160	1,080	1,880	0.3
83	Work loam, 12 to 25 percent slopes	0	210	800	1,010	0.2
	Water areas	2,240	290	520	3,050	0.5
	Total	471,320	61,360	120,960	653,640	100.0

TABLE 11.--YIELDS PER ACRE OF CROPS AND PASTURE

[Yields in the N columns are for nonirrigated soils; those in the I columns are for irrigated soils. Yields are those that can be expected under a high level of management. Absence of data indicates that the soil is not suited to the crop or the crop generally is not grown on the soil]

Soil name and map symbol	Sugar beets		Barley		Corn		Corn silage		Alfalfa hay		Grass hay	
	N	I	N	I	N	I	N	I	N	I	N	I
	Ton	Ton	Bu	Bu	Bu	Bu	Ton	Ton	Ton	Ton	Ton	Ton
Absarokee:												
1	---	---	---	85	---	---	---	---	---	4.5	---	3.5
Agua Fria:												
3	---	---	---	80	---	---	---	20	---	4.5	---	3.5
5	---	---	---	95	---	---	---	22	---	5.0	---	4.0
Ascalon:												
8	---	---	---	110	---	---	---	25	---	5.5	---	3.5
Avalon:												
9	---	27	---	120	---	140	---	28	---	6.5	---	4.5
10	---	25	---	115	---	135	---	25	---	5.5	---	4.0
Beenom:												
12	---	---	---	90	---	---	---	---	---	4.5	---	3.5
Billings:												
14	---	25	---	120	---	130	---	25	---	5.5	---	4.5
15	---	24	---	110	---	120	---	22	---	5.0	---	4.0
Breece:												
17	---	---	---	50	---	---	---	---	---	3.0	---	3.0
Cerro:												
20	---	---	---	85	---	---	---	---	---	4.5	---	3.5
21	---	---	---	75	---	---	---	---	---	4.0	---	3.0
Colona:												
26, 27	---	---	---	90	---	---	---	22	---	4.0	---	3.5
Curecanti:												
30	---	---	---	50	---	---	---	---	---	3.5	---	3.5
Delson:												
32	---	---	---	85	---	---	---	---	---	4.0	---	3.0
Fughes:												
37	---	---	---	50	---	---	---	---	---	---	---	3.5
Glenton:												
42, 43	---	25	---	110	---	130	---	25	---	5.5	---	4.5
Kech:												
46	---	---	---	80	---	---	---	18	---	4.0	---	3.5
Killpack:												
48	---	---	---	70	---	70	---	18	---	4.0	---	3.5
Limon:												
50	---	18	---	80	---	90	---	18	---	5.0	---	3.5
51	---	15	---	70	---	80	---	15	---	4.5	---	3.5

See footnote at end of table.

TABLE 11.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Sugar beets		Barley		Corn		Corn silage		Alfalfa hay		Grass hay	
	N	I	N	I	N	I	N	I	N	I	N	I
	Ton	Ton	Bu	Bu	Bu	Bu	Ton	Ton	Ton	Ton	Ton	Ton
Mesa:												
53	---	27	---	120	---	140	---	28	---	6.5	---	4.5
54	---	25	---	115	---	135	---	25	---	5.5	---	4.0
[1]55	---	20	---	80	---	110	---	20	---	5.0	---	3.5
Potts:												
60	---	---	---	100	---	---	---	24	---	5.0	---	4.0
Progresso:												
61, 62	---	---	---	90	---	---	---	22	---	4.0	---	3.5
[1]63:												
Progresso part	---	---	---	90	---	---	---	22	---	4.0	---	3.5
Potts part	---	---	---	100	---	---	---	24	---	5.0	---	4.0
Radersburg:												
64	---	---	---	50	---	---	---	---	---	3.0	---	3.5
Razor:												
66	---	---	---	50	---	---	---	15	---	3.0	---	3.5
Saraton:												
68	---	---	---	75	---	75	---	15	---	3.5	---	3.5
Scholle:												
71	---	---	---	60	---	---	---	15	---	4.0	---	3.5
Uffens:												
77	---	---	---	---	---	---	---	---	---	---	---	2.0
Utaline:												
78	---	---	---	70	---	---	---	18	---	4.0	---	3.5
Work:												
81	---	---	---	80	---	---	---	---	---	4.0	---	3.5
82	---	---	---	75	---	---	---	---	---	3.5	---	3.0

[1]This map unit is made up of two or more dominant kinds of soil. See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES

[Only the soils that support rangeland vegetation are listed]

Soil name and map symbol	Range site name	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
Absarokee:					
1	Brushy Loam	Favorable	3,000	Gambel oak	20
		Normal	2,000	Serviceberry	10
		Unfavorable	1,500	Mountain bromegrass	10
				Elk sedge	10
				Wheatgrasses	10
				Needlegrasses	5
				Snowberry	5
[1]2:					
Absarokee part	Brushy Loam	Favorable	3,000	Gambel oak	20
		Normal	2,000	Serviceberry	10
		Unfavorable	1,500	Mountain bromegrass	10
				Elk sedge	10
				Wheatgrasses	10
				Needlegrasses	5
				Snowberry	5
Work part	Deep Clay Loam	Favorable	2,500	Western wheatgrass	35
		Normal	2,000	Slender wheatgrass	10
		Unfavorable	1,800	Letterman needlegrass	10
				Big sagebrush	5
				Gambel oak	5
				Saskatoon serviceberry	5
				Common snowberry	5
Agua Fria:					
5	Loamy Foothills	Favorable	1,500	Western wheatgrass	25
		Normal	1,100	Muttongrass	25
		Unfavorable	800	Big sagebrush	10
				Needleandthread	5
				Squirreltail	5
				Fourwing saltbush	5
				Bitterbrush	5
Apishapa:					
6	Mountain Swale	Favorable	3,000	Basin wildrye	25
		Normal	2,000	Western wheatgrass	20
		Unfavorable	1,500	Needlegrasses	20
				Slender wheatgrass	10
				Sedges	10
				Snowberry	5
				Willows	5
Aquic Natrargids:					
7	Salt Meadow			Alkali sacaton	70
				Mat muhly	5
				Rushes	5
				Saltgrass	5
Ascalon:					
8	Loamy Foothills	Favorable	1,500	Western wheatgrass	25
		Normal	1,100	Muttongrass	25
		Unfavorable	800	Big sagebrush	10
				Needleandthread	5
				Squirreltail	5
				Fourwing saltbush	5
				Bitterbrush	5

See footnote at end of table.

TABLE 12.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site name	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
Avalon:					
9, 10	Loamy Saltdesert	Favorable	800	Galleta	40
		Normal	700	Indian ricegrass	15
		Unfavorable	500	Nuttall saltbush	10
				Shadscale	10
				Fourwing saltbush	5
				Bud sagebrush	5
				Winterfat	5
Beenom:					
[1]12:					
Beenom part	Rocky Loam	Favorable	1,400	Western wheatgrass	20
		Normal	1,000	Bluebunch wheatgrass	15
		Unfavorable	700	Prairie junegrass	10
				Bluegrasses	10
				Needleandthread	5
				Idaho fescue	5
				Big sagebrush	5
Absarokee part	Brushy Loam	Favorable	3,000	Gambel oak	20
		Normal	2,000	Serviceberry	10
		Unfavorable	1,500	Mountain bromegrass	10
				Elk sedge	10
				Wheatgrasses	10
				Needlegrasses	5
				Snowberry	5
[1]13:					
Beenom part	Rocky Loam	Favorable	1,400	Western wheatgrass	20
		Normal	1,000	Bluebunch wheatgrass	15
		Unfavorable	700	Prairie junegrass	10
				Bluegrasses	10
				Needleandthread	5
				Idaho fescue	5
				Big sagebrush	5
Absarokee part	Brushy Loam	Favorable	3,000	Gambel oak	20
		Normal	2,000	Serviceberry	10
		Unfavorable	1,500	Mountain bromegrass	10
				Elk sedge	10
				Wheatgrasses	10
				Needlegrasses	5
				Snowberry	5
Billings:					
14, 15, 16	Salt Flats	Favorable	900	Indian ricegrass	15
		Normal	650	Greasewood	15
		Unfavorable	500	Alkali sacaton	15
				Saltgrass	10
				Fourwing saltbush	10
				Western wheatgrass	10
				Galleta	10
Breece:					
17	Mountain Swale	Favorable	2,000	Western wheatgrass	20
		Normal	1,700	Basin wildrye	15
		Unfavorable	1,500	Prairie junegrass	15
				Needlegrass	10
				Bluegrass	5
				Arizona fescue	5

See footnote at end of table.

TABLE 12.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site name	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
Bulkley:					
18, 19	Deep Clay Loam	Favorable	2,500	Wheatgrass	25
		Normal	2,200	Fescue	10
		Unfavorable	1,500	Sedge	10
				Bluebunch wheatgrass	5
				Indian ricegrass	5
				Prairie junegrass	5
				Needlegrass	5
				Bottlebrush squirreltail	5
				Big sagebrush	5
				Gambel oak	5
Cerro:					
20, 21, 22	Deep Clay Loam	Favorable	2,500	Western wheatgrass	25
		Normal	2,000	Needleandthread	10
		Unfavorable	1,200	Big sagebrush	10
				Bluebunch wheatgrass	5
				Nodding bromegrass	5
				Muttongrass	5
				Slender wheatgrass	5
				Bottlebrush squirreltail	5
				Common snowberry	5
				Saskatoon serviceberry	5
				Gambel oak	5
				True mountainmahogany	5
Chipeta:					
23	Clayey Saltdesert	Favorable	500	Mat saltbush	25
		Normal	350	Shadscale	15
		Unfavorable	200	Nuttall saltbush	10
				Indian ricegrass	5
				Galleta	5
				Black sagebrush	5
				Bud sagebrush	5
				Winterfat	5
				Fourwing saltbush	5
Cliffdown:					
24	Loamy Saltdesert	Favorable	800	Galleta	40
		Normal	700	Indian ricegrass	15
		Unfavorable	500	Nuttall saltbush	10
				Shadscale	10
				Fourwing saltbush	5
				Bud sagebrush	5
				Winterfat	5
Cochetopa:					
25	Subalpine Loam	Favorable	4,000	Thurber fescue	40
		Normal	3,500	Parry oatgrass	10
		Unfavorable	3,000	Nodding bromegrass	10
				Bearded wheatgrass	10
				Columbia needlegrass	5
				Silver sagebrush	5
Colona:					
26, 27, 28	Clayey Foothills	Favorable	1,200	Western wheatgrass	50
		Normal	900	Big sagebrush	20
		Unfavorable	600	Galleta	10
				Muttongrass	5
				Squirreltail	5
Curecanti:					
30, 31	Brushy Loam	Favorable	1,000	Gambel oak	20
		Normal	850	Serviceberry	10
		Unfavorable	600	Mountain bromegrass	10
				Elk sedge	10
				Wheatgrasses	10
				Needlegrasses	5
				Snowberry	5

See footnote at end of table.

TABLE 12.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site name	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
Delson:					
32, 33	Deep Clay Loam	Favorable	2,500	Western wheatgrass	30
		Normal	2,000	Needleandthread	10
		Unfavorable	1,200	Muttongrass	5
				Bluebunch wheatgrass	5
				Bottlebrush squirreltail	5
				Big sagebrush	5
				Gambel oak	5
				True mountainmahogany	5
				Common snowberry	5
				Saskatoon serviceberry	5
				Arizona fescue	5
				Slender wheatgrass	5
34	Deep Clay Loam	Favorable	2,500	Western wheatgrass	35
		Normal	2,000	Slender wheatgrass	10
		Unfavorable	1,200	Letterman needlegrass	10
				Big sagebrush	5
				Gambel oak	5
				Saskatoon serviceberry	5
				Common snowberry	5
				Lupine	5
Fughes:					
37, 38, 39, 40	Deep Clay Loam	Favorable	2,500	Western wheatgrass	30
		Normal	2,000	Needleandthread	10
		Unfavorable	1,200	Muttongrass	5
				Bluebunch wheatgrass	5
				Bottlebrush squirreltail	5
				Big sagebrush	5
				Gambel oak	5
				True mountainmahogany	5
				Common snowberry	5
				Saskatoon serviceberry	5
				Arizona fescue	5
				Slender wheatgrass	5
141:					
Fughes part	Deep Clay Loam	Favorable	2,500	Western wheatgrass	30
		Normal	2,000	Needleandthread	10
		Unfavorable	1,200	Muttongrass	5
				Bluebunch wheatgrass	5
				Bottlebrush squirreltail	5
				Big sagebrush	5
				Gambel oak	5
				True mountainmahogany	5
				Common snowberry	5
				Saskatoon serviceberry	5
				Arizona fescue	5
				Slender wheatgrass	5
Curecanti part	Brushy Loam	Favorable	3,000	Gambel oak	20
		Normal	2,000	Serviceberry	10
		Unfavorable	1,500	Mountain bromegrass	10
				Elk sedge	10
				Wheatgrasses	10
				Needlegrasses	5
				Snowberry	5

See footnote at end of table.

TABLE 12.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site name	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
Glenton:					
42, 43	Sandy Saltdesert	Favorable	700	Needleandthread	25
		Normal	500	Shadscale	15
		Unfavorable	300	Indian ricegrass	10
				Sand dropseed	10
				Big sagebrush	10
				Tall rabbitbrush	10
				Galleta	5
				Squirreltail	5
Kech:					
146:					
Kech part.					
Progresso part	Loamy Foothills	Favorable	1,500	Western wheatgrass	25
		Normal	1,100	Muttongrass	25
		Unfavorable	800	Big sagebrush	10
				Needleandthread	5
				Squirreltail	5
				Fourwing saltbush	5
				Bitterbrush	5
Killpack:					
48	Clayey Saltdesert	Favorable	500	Mat saltbush	25
		Normal	350	Shadscale	15
		Unfavorable	200	Nuttal saltbush	10
				Indian ricegrass	5
				Galleta	5
				Black sagebrush	5
				Bud sagebrush	5
				Winterfat	5
				Fourwing saltbush	5
Lazear:					
149:					
Lazear part	Saltdesert Breaks	Favorable	500	Shadscale	30
		Normal	350	Galleta	30
		Unfavorable	200	Saline wildrye	20
				Indian ricegrass	5
				Winterfat	5
				Bud sagebrush	5
				Fourwing saltbush	5
Rock outcrop part.					
Limon:					
50, 51	Salt Flats	Favorable	900	Indian ricegrass	15
		Normal	650	Greasewood	15
		Unfavorable	500	Alkali sacaton	15
				Saltgrass	10
				Fourwing saltbush	10
				Western wheatgrass	10
				Galleta	10
Meeteetse:					
52	Stony Saltdesert	Favorable	800	Galleta	30
		Normal	600	Shadscale	20
		Unfavorable	500	Indian ricegrass	15
				Bud sagebrush	5
				Winterfat	5
				Rabbitbrush	5

See footnote at end of table.

TABLE 12.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site name	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
Mesa:					
53, 54	Loamy Saltdesert	Favorable	800	Galleta	40
		Normal	700	Indian ricegrass	15
		Unfavorable	500	Nuttall saltbush	10
				Shadscale	10
				Fourwing saltbush	5
				Bud sagebrush	5
155:					
Mesa part	Loamy Saltdesert	Favorable	800	Galleta	40
		Normal	700	Indian ricegrass	15
		Unfavorable	500	Nuttall saltbush	10
				Shadscale	10
				Fourwing saltbush	5
				Bud sagebrush	5
Utaline part	Stony Saltdesert	Favorable	800	Galleta	30
		Normal	600	Shadscale	20
		Unfavorable	500	Indian ricegrass	15
				Bud sagebrush	5
				Winterfat	5
				Rabbitbrush	5
Northwater:					
57	Subalpine Loam	Favorable	4,000	Thurber fescue	30
		Normal	3,000	Parry oatgrass	10
		Unfavorable	2,500	Nodding bromegrass	10
				Columbia needlegrass	10
				Bearded wheatgrass	5
				Aspen peavine	5
				Silver sagebrush	5
Persayo:					
59	Silty Saltdesert	Favorable	650	Galleta	35
		Normal	500	Shadscale	15
		Unfavorable	400	Low phlox	7
				Indian ricegrass	6
				Saline wildrye	6
				Douglas rabbitbrush	5
Potts:					
60	Loamy Foothills	Favorable	1,500	Western wheatgrass	25
		Normal	1,100	Muttongrass	25
		Unfavorable	800	Big sagebrush	10
				Needleandthread	5
				Squirreltail	5
				Fourwing saltbush	5
				Bitterbrush	5
Progresso:					
61, 62	Loamy Foothills	Favorable	1,500	Western wheatgrass	25
		Normal	1,100	Muttongrass	25
		Unfavorable	800	Big sagebrush	10
				Needleandthread	5
				Squirreltail	5
				Fourwing saltbush	5
				Bitterbrush	5

See footnote at end of table.

TABLE 12.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site name	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
Progresso:					
[1]63:					
Progresso part--	Loamy Foothills	Favorable	1,500	Western wheatgrass	25
		Normal	1,100	Muttongrass	25
		Unfavorable	800	Big sagebrush	10
				Needleandthread	5
				Squirreltail	5
				Fourwing saltbush	5
				Bitterbrush	5
Potts part	Loamy Foothills	Favorable	1,500	Western wheatgrass	25
		Normal	1,100	Muttongrass	25
		Unfavorable	800	Big sagebrush	10
				Needleandthread	5
				Squirreltail	5
				Fourwing saltbush	5
				Bitterbrush	5
Radersburg:					
64, 65	Mountain Loam	Favorable	1,800	Arizona fescue	15
		Normal	1,500	Western wheatgrass	10
		Unfavorable	1,200	Bromegrasses	10
				Big sagebrush	10
				Slender wheatgrass	5
				Junegrass	5
				Muttongrass	5
Razor:					
66	Clayey Foothills	Favorable	1,500	Western wheatgrass	50
		Normal	900	Big sagebrush	20
		Unfavorable	600	Galleta	10
				Muttongrass	5
				Squirreltail	5
Scholle:					
71, 72	Loamy Foothills	Favorable	1,500	Western wheatgrass	25
		Normal	1,100	Muttongrass	25
		Unfavorable	800	Big sagebrush	10
				Needleandthread	5
				Squirreltail	5
				Fourwing saltbush	5
				Bitterbrush	5
Shavano:					
[1]73:					
Shavano part	Loamy Saltdesert	Favorable	800	Galleta	40
		Normal	700	Indian ricegrass	15
		Unfavorable	500	Nuttall saltbush	10
				Shadscale	10
				Fourwing saltbush	5
				Bud sagebrush	5
				Winterfat	5
Lazear part	Saltdesert Breaks	Favorable	500	Shadscale	30
		Normal	350	Galleta	30
		Unfavorable	200	Saline wildrye	20
				Indian ricegrass	5
				Winterfat	5
				Bud sagebrush	5
				Fourwing saltbush	5

See footnote at end of table.

TABLE 12.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site name	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
Uffens:					
77	Alkaline Slopes	Favorable	700	Big sagebrush	20
		Normal	550	Greasewood	20
		Unfavorable	400	Shadscale	10
				Galleta	10
				Indian ricegrass	5
				Green molly	5
Utaline:					
78, 79	Stony Saltdesert	Favorable	800	Galleta	30
		Normal	600	Shadscale	20
		Unfavorable	500	Indian ricegrass	15
				Bud sagebrush	5
				Winterfat	5
				Rabbitbrush	5
[1]80:					
Utaline part	Stony Saltdesert	Favorable	800	Galleta	30
		Normal	600	Shadscale	20
		Unfavorable	500	Indian ricegrass	15
				Bud sagebrush	5
				Winterfat	5
				Rabbitbrush	5
Torriorthents part.					
Work:					
81, 82, 83	Deep Clay Loam	Favorable	2,500	Western wheatgrass	30
		Normal	2,000	Needleandthread	10
		Unfavorable	1,200	Muttongrass	5
				Bluebunch wheatgrass	5
				Bottlebrush squirreltail	5
				Big sagebrush	5
				Gambel oak	5
				True mountainmahogany	5
				Common snowberry	5
				Saskatoon serviceberry	5
				Arizona fescue	5
				Slender wheatgrass	5

[1]This map unit is made up of two or more dominant kinds of soil. See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 13.--BUILDING SITE DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Absarokee:					
1	Severe: depth to rock, too clayey.	Severe: shrink-swell, low strength.	Severe: depth to rock, low strength, shrink-swell.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.
[1]2:					
Absarokee part	Severe: slope, depth to rock, too clayey.	Severe: slope, shrink-swell, low strength.	Severe: slope, depth to rock, shrink-swell.	Severe: slope, low strength, shrink-swell.	Severe: slope, shrink-swell, low strength.
Work part	Severe: slope.	Severe: slope, shrink-swell, low strength.	Severe: slope, shrink-swell, low strength.	Severe: slope, shrink-swell, low strength.	Severe: shrink-swell, low strength, slope.
Agua Fria:					
3	Severe: large stones.	Moderate: shrink-swell, large stones.	Moderate: large stones, shrink-swell.	Moderate: slope, shrink-swell, large stones.	Moderate: shrink-swell, low strength, large stones.
4	Severe: large stones, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
5	Severe: large stones.	Moderate: shrink-swell, large stones.	Moderate: shrink-swell, large stones.	Moderate: shrink-swell, large stones.	Moderate: low strength, shrink-swell, large stones.
Apishapa:					
6	Severe: wetness, too clayey,	Severe: floods, wetness, shrink-swell.	Severe: floods, wetness, shrink-swell.	Severe: floods, wetness, shrink-swell.	Severe: floods, wetness, shrink-swell.
Aquic Natrargids:					
7.					
Ascalon:					
8	Slight	Moderate: low strength.	Moderate: low strength.	Moderate: slope, low strength.	Moderate: frost action, low strength.
Avalon:					
9	Slight	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Moderate: low strength, frost action.
10	Slight	Moderate: low strength. low strength.	Moderate: low strength.	Moderate: slope, low strength.	Moderate: low strength, frost action.
Badland:					
11.					
Beenom:					
[1]12:					
Beenom part	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.

See footnote at end of table.

TABLE 13.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Beenom:					
112:					
Absarokee part-	Severe: depth to rock, too clayey.	Severe: shrink-swell, low strength.	Severe: depth to rock, low strength, shrink-swell.	Severe: slope, shrink-swell, low strength.	Severe: shrink-swell, low strength.
113:					
Beenom part----	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.
Absarokee part-	Severe: slope, depth to rock, too clayey.	Severe: slope, shrink-swell, low strength.	Severe: slope, depth to rock, shrink-swell.	Severe: slope, shrink-swell, low strength.	Severe: slope, shrink-swell, low strength.
Billings:					
14, 15, 16-------	Slight----------	Moderate: low strength, shrink-swell.	Moderate: low strength, shrink-swell.	Moderate: low strength, shrink-swell.	Severe: low strength.
Breece:					
17----------	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: frost action.
Bulkley:					
18, 19----------	Severe: slope, too clayey.	Severe: shrink-swell, slope, low strength.	Severe: shrink-swell, slope, low strength.	Severe: shrink-swell, slope, low strength.	Severe: shrink-swell, slope, low strength.
Cerro:					
20----------	Severe: too clayey.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.
21----------	Severe: too clayey.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, slope, low strength.	Severe: shrink-swell, low strength.
22----------	Severe: too clayey, slope.	Severe: shrink-swell, slope, low strength.	Severe: shrink-swell, slope, low strength.	Severe: shrink-swell, slope, low strength.	Severe: shrink-swell, slope, low strength.
Chipeta:					
23----------	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, low strength.
Cliffdown:					
24----------	Severe: small stones, cutbanks cave.	Slight----------	Slight----------	Moderate: slope.	Slight.
Cochetopa:					
25----------	Severe: too clayey, slope.	Severe: shrink-swell, slope, low strength.	Severe: shrink-swell, slope, low strength.	Severe: shrink-swell, slope, low strength.	Severe: shrink-swell, slope, low strength.
Colona:					
26----------	Severe: too clayey.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.

See footnote at end of table.

TABLE 13.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Colona:					
27	Severe: too clayey.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: slope, shrink-swell, low strength.	Severe: shrink-swell, low strength.
28	Severe: slope, too clayey.	Severe: slope, shrink-swell, low strength.	Severe: slope, shrink-swell, low strength.	Severe: slope, shrink-swell, low strength.	Severe: slope, shrink-swell, low strength.
Cryoborolls: 29.					
Curecanti:					
30	Severe: large stones, cutbanks cave.	Severe: large stones.	Severe: large stones.	Severe: slope,	Severe: large stones.
31	Severe: large stones, slope.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.
Delson:					
32	Severe: too clayey.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.
33	Severe: too clayey.	Severe: shrink-swell, low strength.	Severe: shrink-swell.	Severe: slope, shrink-swell, low strength.	Severe: shrink-swell, low strength.
34	Severe: slope, too clayey, large stones.	Severe: slope, shrink-swell, large stones.	Severe: slope, shrink-swell, large stones.	Severe: slope, shrink-swell, large stones.	Severe: slope, shrink-swell, low strength.
Fluvaquents: 35.					
Fluvents: 36.					
Fughes:					
37	Severe: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: slope, shrink-swell.	Severe: low strength, shrink-swell.
38, 39, 40	Severe: slope, too clayey.	Severe: slope, shrink-swell.	Severe: slope, shrink-swell.	Severe: slope, shrink-swell.	Severe: slope, low strength, shrink-swell.
[1]41:					
Fughes part	Severe: slope, too clayey.	Severe: slope, shrink-swell.	Severe: slope, shrink-swell.	Severe: slope, shrink-swell.	Severe: slope, low strength, shrink-swell.
Curecanti part	Severe: large stones, slope, cutbanks cave.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.
Glenton:					
42, 43	Moderate: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods.
Gullied land: 44.					

See footnote at end of table.

TABLE 13.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Haplaquolls: 45.					
Kech: [1]46:					
Kech part	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock, low strength.
Progresso part	Severe: depth to rock.	Moderate: depth to rock, shrink-swell.	Severe: depth to rock.	Moderate: slope, depth to rock, shrink-swell.	Moderate: depth to rock, shrink-swell.
[1]47:					
Kech part	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, low strength.
Rock outcrop part.					
Killpack: 48	Moderate: depth to rock.	Moderate: low strength, shrink-swell.	Moderate: depth to rock, shrink-swell, low strength.	Moderate: low strength, shrink-swell, slope.	Severe: low strength.
Lazear: [1]49:					
Lazear part	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.
Rock outcrop part.					
Limon: 50, 51	Severe: too clayey.	Severe: floods, shrink-swell, low strength.	Severe: floods, shrink-swell, low strength.	Severe: floods, shrink-swell, low strength.	Severe: floods, shrink-swell, low strength.
Meeteetse: 52	Moderate: slope, too clayey, large stones.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: slope, shrink-swell.	Severe: low strength, shrink-swell.
Mesa: 53	Moderate: small stones.	Slight	Slight	Slight	Moderate: low strength.
54	Moderate: small stones.	Slight	Slight	Moderate: slope.	Moderate: low strength.
[1]55:					
Mesa part	Moderate: small stones.	Slight	Slight	Moderate: slope.	Moderate: low strength.
Utaline part	Severe: large stones.	Severe: large stones.	Severe: large stones.	Severe: slope, large stones.	Severe: large stones.
Midway: [1]56:					
Midway part	Severe: slope, too clayey, depth to rock.	Severe: slope, shrink-swell, low strength.	Severe: slope, shrink-swell, low strength.	Severe: slope, shrink-swell, low strength.	Severe: slope, shrink-swell, low strength.

See footnote at end of table.

TABLE 13.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Midway:					
[1]56:					
Gaynor part----	Severe: slope.	Severe: slope, shrink-swell, low strength.	Severe: slope, shrink-swell, low strength.	Severe: shrink-swell, slope, low strength.	Severe: slope, shrink-swell, low strength.
Northwater:					
57, 58----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Persayo:					
59----------	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope.
Potts:					
60----------	Slight----------	Moderate: low strength, shrink-swell.	Moderate: low strength, shrink-swell.	Moderate: low strength, shrink-swell.	Moderate: low strength, shrink-swell.
Progresso:					
61----------	Severe: depth to rock.	Moderate: depth to rock, shrink-swell.	Severe: depth to rock.	Moderate: slope, depth to rock, shrink-swell.	Moderate: depth to rock, shrink-swell.
62----------	Severe: depth to rock.	Moderate: depth to rock, shrink-swell, slope.	Severe: depth to rock.	Severe: slope.	Moderate: depth to rock, shrink-swell, slope.
[1]63:					
Progresso part-	Severe: depth to rock.	Moderate: depth to rock, shrink-swell.	Severe: depth to rock.	Moderate: slope, depth to rock, shrink-swell.	Moderate: depth to rock, shrink-swell.
Potts part-----	Slight----------	Moderate: low strength, shrink-swell.	Moderate: low strength, shrink-swell.	Moderate: low strength, shrink-swell.	Moderate: low strength, shrink-swell.
Radersburg:					
64----------	Moderate: slope, large stones.	Moderate: slope, low strength, large stones.	Moderate: slope, low strength, large stones.	Severe: slope.	Moderate: slope, low strength, large stones.
65----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Razor:					
66----------	Moderate: depth to rock, too clayey.	Severe: shrink-swell.	Severe: shrink-swell, depth to rock.	Severe: shrink-swell.	Severe: shrink-swell, low strength.
Rock outcrop:					
67.					
Saraton:					
68----------	Severe: small stones, depth to rock.	Moderate: depth to rock.	Severe: depth to rock.	Moderate: slope, depth to rock.	Moderate: depth to rock.
69----------	Severe: small stones, depth to rock.	Moderate: slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Moderate: slope, depth to rock.

See footnote at end of table.

TABLE 13.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Saraton:					
[1]70:					
Saraton part	Severe: slope, small stones, depth to rock.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope.
Agua Fria part	Severe: large stones, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Scholle:					
71	Moderate: small stones.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: slope, shrink-swell.	Moderate: shrink-swell, low strength.
72	Moderate: slope, small stones.	Moderate: slope, shrink-swell.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: slope, shrink-swell, low strength.
Shavano:					
[1]73:					
Shavano part	Severe: depth to rock.	Moderate: depth to rock.	Severe: depth to rock.	Moderate: depth to rock, slope.	Moderate: depth to rock.
Lazear part	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.
Torriorthents:					
[1]74:					
Torriorthents part.					
Haplargids part.					
[1]75:					
Torriorthents part.					
Rock outcrop part.					
[1]76:					
Torriorthents part.					
Rock outcrop part.					
Uffens:					
77	Slight	Slight	Moderate: shrink-swell.	Slight	Moderate: shrink-swell, low strength.
Utaline:					
78	Severe: large stones.	Severe: large stones.	Severe: large stones.	Severe: large stones.	Severe: large stones.
79	Severe: large stones.	Severe: large stones.	Severe: large stones.	Severe: slope, large stones.	Severe: large stones.
[1]80:					
Utaline part	Severe: large stones, slope.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.

See footnote at end of table.

TABLE 13.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Utaline: [1]80: Torriorthents part.					
Work: 81	Moderate: too clayey.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.
82	Moderate: slope, too clayey.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: slope, shrink-swell, low strength.	Severe: shrink-swell, low strength.
83	Severe: slope.	Severe: slope, shrink-swell, low strength.	Severe: slope, shrink-swell, low strength.	Severe: slope, shrink-swell, low strength.	Severe: shrink-swell, low strength, slope.

[1]This map unit is made up of two or more dominant kinds of soil. See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--SANITARY FACILITIES

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," "good," and "fair." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Absarokee:					
1	Severe: depth to rock, percs slowly.	Severe: slope, depth to rock.	Severe: depth to rock, too clayey.	Slight	Poor: too clayey.
12:					
Absarokee part	Severe: slope, depth to rock, percs slowly.	Severe: slope, depth to rock.	Severe: depth to rock, too clayey.	Severe: slope.	Poor: slope, too clayey.
Work part	Severe: slope, percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Severe: slope.	Poor: slope.
Agua Fria:					
3	Moderate: large stones, percs slowly.	Severe: seepage, slope.	Severe: large stones, seepage.	Severe: seepage.	Poor: large stones.
4	Severe: slope.	Severe: seepage, slope.	Severe: slope, large stones.	Severe: slope, seepage.	Poor: large stones, slope.
5	Moderate: large stones, percs slowly.	Severe: seepage.	Severe: large stones, seepage.	Severe: seepage.	Poor: large stones.
Apishapa:					
6	Severe: percs slowly, wetness.	Severe: wetness, floods.	Severe: wetness, too clayey.	Severe: wetness.	Poor: wetness, too clayey.
Aquic Natrargids:					
7	Severe: wetness.	Severe: wetness.	Severe: wetness.		
Ascalon:					
8	Slight	Severe: seepage.	Severe: seepage.	Severe: seepage.	Good.
Avalon:					
9	Slight	Moderate: seepage.	Slight	Slight	Good.
10	Slight	Moderate: slope, seepage.	Slight	Slight	Good.
Badland:					
11.					
Beenom:					
12:					
Beenom part	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: slope.	Poor: thin layer, area reclaim, slope.
Absarokee part	Severe: depth to rock, percs slowly.	Severe: slope, depth to rock.	Severe: depth to rock, too clayey.	Moderate: slope.	Poor: too clayey.

See footnote at end of table.

TABLE 14.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Beenom:					
13:					
Beenom part	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: thin layer, area reclaim, slope.
Absarokee part	Severe: slope, depth to rock, percs slowly.	Severe: slope, depth to rock.	Severe: slope, depth to rock, too clayey.	Severe: slope.	Poor: slope, too clayey.
Billings:					
14	Severe: percs slowly.	Slight	Moderate: too clayey.	Slight	Fair: too clayey.
15, 16	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Breece:					
17	Moderate: wetness.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Fair: small stones.
Bulkley:					
18, 19	Severe: percs slowly, slope.	Severe: slope.	Severe: too clayey.	Severe: slope.	Poor: slope, too clayey.
Cerro:					
20	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey.
21	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey.
22	Severe: percs slowly, slope.	Severe: slope.	Severe: too clayey.	Severe: slope.	Poor: too clayey, slope.
Chipeta:					
23	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Poor: slope, thin layer, area reclaim.
Cliffdown:					
24	Slight	Severe: seepage, small stones.	Severe: small stones.	Slight	Poor: small stones.
Cochetopa:					
25	Severe: percs slowly, slope.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: slope, too clayey.
Colona:					
26	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey.
27	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey.
28	Severe: slope, percs slowly.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: too clayey, slope.

See footnote at end of table.

TABLE 14.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Cryoborolls: 29.					
Curecanti: 30	Severe: large stones.	Severe: seepage, slope, large stones.	Severe: seepage, large stones.	Severe: seepage.	Poor: large stones.
31	Severe: slope, large stones.	Severe: seepage, slope, large stones.	Severe: seepage, large stones.	Severe: seepage, slope.	Poor: large stones, slope.
Delson: 32	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Slight	Poor: too clayey.
33	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey.
34	Severe: slope, percs slowly.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: slope.
Fluvaquents: 35	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Poor: wetness.
Fluvents: 36	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	
Fughes: 37	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey.
38, 40	Severe: slope, percs slowly.	Severe: slope.	Severe: too clayey.	Severe: slope.	Poor: slope, too clayey.
39	Severe: slope, percs slowly.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: slope, too clayey.
141: Fughes part	Severe: slope, percs slowly.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: slope, too clayey.
Curecanti part	Severe: slope, large stones.	Severe: seepage, slope, large stones.	Severe: slope, seepage, large stones.	Severe: seepage, slope.	Poor: large stones, slope.
Glenton: 42, 43	Moderate: floods.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Good.
Gullied land: 44.					
Haplaquolls: 45	Severe: floods, wetness.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Poor: wetness.

See footnote at end of table.

TABLE 14.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Kech:					
146:					
Kech part	Severe: depth to rock, percs slowly.	Severe: slope, depth to rock.	Severe: depth to rock.	Moderate: slope.	Poor: thin layer, area reclaim.
Progresso part	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight	Fair: thin layer, area reclaim.
147:					
Kech part	Severe: depth to rock, slope, percs slowly.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope.	Poor: thin layer, area reclaim, slope.
Rock outcrop part.					
Killpack:					
48	Severe: percs slowly, depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Slight	Fair: too clayey, thin layer, area reclaim.
Lazear:					
149:					
Lazear part	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: slope.	Poor: thin layer, slope, area reclaim.
Rock outcrop part.					
Limon:					
50, 51	Severe: percs slowly.	Moderate: floods.	Severe: too clayey.	Moderate: floods.	Poor: too clayey.
Meeteetse:					
52	Severe: percs slowly.	Severe: slope.	Moderate: large stones, too clayey.	Moderate: slope.	Fair: too clayey.
Mesa:					
53, 54	Slight	Severe: seepage, small stones.	Severe: seepage.	Severe: seepage.	Poor: small stones.
155:					
Mesa part	Slight	Severe: seepage, small stones.	Severe: seepage.	Severe: seepage.	Poor: small stones.
Utaline part	Severe: large stones.	Severe: slope, large stones.	Severe: large stones.	Moderate: slope.	Poor: large stones.
Midway:					
156:					
Midway part	Severe: slope, percs slowly, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: slope.	Poor: slope, thin layer, area reclaim.

See footnote at end of table.

TABLE 14.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Midway:					
56:					
Gaynor part	Severe: slope, percs slowly, depth to rock.	Severe: depth to rock, slope.	Severe: too clayey, depth to rock.	Severe: slope.	Poor: slope, too clayey.
Northwater:					
57	Severe: slope.	Severe: large stones, slope.	Moderate: slope, large stones.	Severe: slope.	Poor: slope.
58	Severe: slope.	Severe: slope, large stones.	Severe: slope.	Severe: slope.	Poor: slope.
Persayo:					
59	Severe: depth to rock, slope, percs slowly.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: slope.	Poor: thin layer, slope, area reclaim.
Potts:					
60	Moderate: percs slowly.	Moderate: slope, seepage.	Slight	Slight	Fair: too clayey.
Progresso:					
61	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight	Fair: thin layer, area reclaim.
62	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Moderate: slope.	Fair: thin layer, slope, area reclaim.
63:					
Progresso part	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight	Fair: thin layer, area reclaim.
Potts part	Moderate: percs slowly.	Moderate: slope, seepage.	Slight	Slight	Fair: too clayey.
Radersburg:					
64	Moderate: percs slowly, slope, large stones.	Severe: small stones, slope.	Moderate: large stones.	Moderate: slope.	Poor: small stones.
65	Severe: slope.	Severe: small stones, slope.	Moderate: large stones, slope.	Severe: slope.	Poor: small stones, slope.
Razor:					
66	Severe: percs slowly, depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Slight	Fair: too clayey, thin layer, area reclaim.
Rock outcrop:					
67.					
Saraton:					
68	Severe: depth to rock.	Severe: slope, small stones, depth to rock.	Severe: depth to rock.	Slight	Poor: small stones, thin layer, area reclaim.

See footnote at end of table.

TABLE 14.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Saraton:					
69	Severe: depth to rock.	Severe: slope, small stones, depth to rock.	Severe: depth to rock.	Moderate: slope.	Poor: small stones, thin layer, area reclaim.
[1]70:					
Saraton part	Severe: slope, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Poor: slope, small stones, thin layer.
Agua Fria part	Severe: slope.	Severe: seepage, slope.	Severe: large stones, seepage.	Severe: slope, seepage.	Poor: large stones, slope.
Scholle:					
71	Slight	Severe: slope.	Slight	Slight	Fair: small stones.
72	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.	Fair: slope, small stones.
Shavano:					
[1]73:					
Shavano part	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Slight	Fair: thin layer, area reclaim.
Lazear part	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Slight	Poor: thin layer, area reclaim.
Torriorthents:					
[1]74:					
Torriorthents part.					
Haplargids part.					
[1]75:					
Torriorthents part.					
Rock outcrop part.					
[1]76:					
Torriorthents part.					
Rock outcrop part.					
Uffens:					
77	Slight	Severe: seepage.	Severe: seepage.	Severe: seepage.	Good.
Utaline:					
78	Severe: large stones.	Severe: slope, large stones.	Severe: large stones.	Slight	Poor: large stones.
79	Severe: large stones.	Severe: slope, large stones.	Severe: large stones.	Moderate: slope.	Poor: large stones.

See footnote at end of table.

TABLE 14.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Utaline: [1]80:					
Utaline part	Severe: slope, large stones.	Severe: slope, large stones.	Severe: large stones.	Severe: slope.	Poor: large stones, slope.
Torriorthents part.					
Work:					
81	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
82	Severe: percs slowly.	Severe: slope.	Moderate: too clayey.	Moderate: slope.	Fair: slope, too clayey.
83	Severe: slope, percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Severe: slope.	Poor: slope.

[1]This map unit is made up of two or more dominant kinds of soil. See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 15.--CONSTRUCTION MATERIALS

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," and "poor." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Absarokee:				
1	Poor: shrink-swell, low strength, thin layer.	Unsuited	Unsuited	Poor: too clayey, small stones.
12:				
Absarokee part	Poor: shrink-swell, low strength, thin layer.	Unsuited	Unsuited	Poor: slope, too clayey, small stones.
Work part	Poor: shrink-swell, low strength.	Unsuited	Unsuited	Poor: slope, too clayey.
Agua Fria:				
3	Fair: large stones.	Unsuited	Unsuited: large stones.	Poor: large stones, too clayey.
4	Fair: slope, large stones.	Unsuited	Unsuited: large stones.	Poor: slope, large stones, too clayey.
5	Fair: large stones.	Unsuited	Unsuited: large stones.	Poor: large stones, too clayey.
Apishapa:				
6	Poor: wetness, shrink-swell, low strength.	Unsuited	Unsuited	Poor: wetness, too clayey.
Aquic Natrargids:				
7.				
Ascalon:				
8	Fair: low strength, frost action, shrink-swell.	Unsuited	Unsuited	Good.
Avalon:				
9, 10	Fair: frost action, low strength.	Unsuited	Unsuited	Fair: small stones.
Badland:				
11.				
Beenom:				
12:				
Beenom part	Poor: thin layer, area reclaim.	Unsuited	Unsuited	Poor: thin layer, area reclaim, slope.
Absarokee part	Poor: shrink-swell, low strength, thin layer.	Unsuited	Unsuited	Poor: too clayey, small stones.

See footnote at end of table.

TABLE 15.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Beenom: [1]13:				
Beenom part	Poor: thin layer, area reclaim, slope.	Unsuited	Unsuited	Poor: thin layer, area reclaim, slope.
Absarokee part	Poor: slope, shrink-swell, low strength.	Unsuited	Unsuited	Poor: slope, too clayey, small stones.
Billings: 14, 15, 16	Poor: low strength.	Unsuited	Unsuited	Fair: too clayey, excess salt.
Breece: 17	Fair: frost action.	Poor: excess fines.	Unsuited	Fair: small stones.
Bulkley: 18, 19	Poor: shrink-swell, low strength.	Unsuited	Unsuited	Poor: slope, too clayey.
Cerro: 20, 21	Poor: shrink-swell, low strength.	Unsuited	Unsuited	Poor: too clayey.
22	Poor: shrink-swell, low strength.	Unsuited	Unsuited	Poor: slope, large stones, too clayey.
Chipeta: 23	Poor: low strength, area reclaim, thin layer.	Unsuited	Unsuited	Poor: slope, area reclaim, excess salt.
Cliffdown: 24	Good	Poor: excess fines.	Fair: excess fines.	Poor: small stones.
Cochetopa: 25	Poor: shrink-swell, slope, low strength.	Unsuited	Unsuited	Poor: slope, large stones.
Colona: 26, 27	Poor: shrink-swell, low strength.	Unsuited	Unsuited	Poor: too clayey.
28	Poor: slope, shrink-swell, low strength.	Unsuited	Unsuited	Poor: slope, too clayey.

See footnote at end of table.

TABLE 15.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Cryoborolls: 29.				
Curecanti: 30	Fair: frost action.	Unsuited	Unsuited	Fair: small stones, large stones.
31	Fair: frost action, slope.	Unsuited	Unsuited	Poor: small stones, slope, large stones.
Delson: 32	Poor: shrink-swell, low strength.	Unsuited	Unsuited	Fair: too clayey, small stones, large stones.
33	Poor: shrink-swell, low strength.	Unsuited	Unsuited	Fair: large stones, small stones, too clayey.
34	Poor: slope, low strength.	Unsuited	Unsuited	Poor: slope, large stones.
Fluvaquents: 35.				
Fluvents: 36.				
Fughes: 37	Poor: low strength, shrink-swell.	Unsuited	Unsuited	Poor: too clayey.
38	Poor: low strength, shrink-swell.	Unsuited	Unsuited	Poor: slope, too clayey.
39	Poor: slope, low strength, shrink-swell.	Unsuited	Unsuited	Poor: slope, too clayey.
40	Poor: low strength, shrink-swell.	Unsuited	Unsuited	Poor: slope, too clayey.
[1]41: Fughes part	Poor: slope, low strength, shrink-swell.	Unsuited	Unsuited	Poor: slope, too clayey.
Curecanti part	Poor: slope.	Unsuited	Unsuited	Poor: small stones, slope, large stones.
Glenton: 42, 43	Fair: low strength.	Poor: excess fines.	Unsuited	Good.

See footnote at end of table.

TABLE 15.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Gullied land: 44.				
Haplaquolls: 45.				
Kech:				
146:				
Kech part	Poor: thin layer, area reclaim.	Unsuited	Unsuited	Poor: small stones, thin layer, area reclaim.
Progresso part	Poor: thin layer, area reclaim.	Unsuited	Unsuited	Fair: too clayey.
147:				
Kech part	Poor: thin layer, area reclaim, slope.	Unsuited	Unsuited	Poor: area reclaim, slope, small stones.
Rock outcrop part.				
Killpack: 48	Poor: low strength, thin layer, area reclaim.	Unsuited	Unsuited	Fair: too clayey, excess salt.
Lazear:				
149:				
Lazear part	Poor: thin layer, area reclaim.	Unsuited	Unsuited	Poor: slope, small stones, area reclaim.
Rock outcrop part.				
Limon: 50, 51	Poor: shrink-swell, low strength.	Unsuited	Unsuited	Poor: too clayey.
Meeteetse: 52	Poor: low strength.	Unsuited	Unsuited	Poor: too clayey, excess sodium.
Mesa:				
53, 54	Good	Unsuited	Poor: excess fines.	Poor: small stones.
155:				
Mesa part	Good	Unsuited	Poor: excess fines.	Poor: small stones.
Utaline part	Fair: large stones, low strength.	Unsuited	Unsuited: large stones.	Poor: small stones, large stones.
Midway:				
156:				
Midway part	Poor: slope, shrink-swell, low strength.	Unsuited	Unsuited	Severe: slope.

See footnote at end of table.

TABLE 15.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Midway:				
[1]56:				
Gaynor part	Poor: shrink-swell, thin layer, low strength.	Unsuited	Unsuited	Poor: slope, too clayey.
Northwater:				
57	Fair: slope, low strength.	Unsuited	Unsuited	Poor: slope.
58	Poor: slope.	Unsuited	Unsuited	Poor: slope, small stones.
Persayo:				
59	Poor: thin layer, area reclaim, low strength.	Unsuited	Unsuited	Poor: area reclaim, slope.
Potts:				
60	Fair: low strength.	Unsuited	Unsuited	Fair: too clayey.
Progresso:				
61	Poor: thin layer, area reclaim.	Unsuited	Unsuited	Fair: too clayey.
62	Fair: thin layer, area reclaim.	Unsuited	Unsuited	Fair: slope, too clayey.
[1]63:				
Progresso part	Fair: thin layer, area reclaim.	Unsuited	Unsuited	Fair: area reclaim, too clayey.
Potts part	Fair: low strength.	Unsuited	Unsuited	Fair: too clayey.
Radersburg:				
64	Fair: low strength.	Unsuited	Unsuited	Poor: small stones.
65	Fair: low strength, slope.	Unsuited	Unsuited	Poor: small stones, slope.
Razor:				
66	Poor: shrink-swell, low strength, thin layer.	Unsuited	Unsuited	Poor: too clayey.
Rock outcrop:				
67.				
Saraton:				
68, 69	Poor: thin layer, area reclaim.	Unsuited	Unsuited: thin layer.	Poor: small stones.
[1]70:				
Saraton part	Poor: slope, thin layer, area reclaim.	Unsuited	Unsuited: thin layer.	Poor: slope, small stones.
Agua Fria part	Fair: slope, shrink-swell, large stones.	Unsuited	Poor: large stones, excess fines.	Poor: slope, large stones, too clayey.

See footnote at end of table.

TABLE 15.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Scholle:				
71, 72	Fair: low strength, shrink-swell.	Unsuited	Unsuited	Poor: small stones.
Shavano:				
[1]73:				
Shavano part	Poor: thin layer, slope.	Unsuited	Unsuited	Fair: area reclaim, small stones.
Lazear part	Poor: thin layer, area reclaim.	Unsuited	Unsuited	Poor: small stones, area reclaim.
Torriorthents:				
[1]74:				
Torriorthents part.				
Haplargids part.				
[1]75:				
Torriorthents part.				
Rock outcrop part.				
[1]76:				
Torriorthents part.				
Rock outcrop part.				
Uffens:				
77	Fair: low strength, shrink-swell.	Poor: excess fines.	Unsuited	Poor: excess salt, excess sodium.
Utaline:				
78, 79	Fair: low strength, large stones.	Unsuited	Unsuited	Poor: small stones, large stones.
[1]80:				
Utaline part	Fair: slope, low strength, large stones.	Unsuited	Unsuited	Poor: small stones, slope, large stones.
Torriorthents part.				
Work:				
81, 82	Poor: shrink-swell, low strength.	Unsuited	Unsuited	Poor: too clayey.
83	Poor: shrink-swell, low strength.	Unsuited	Unsuited	Poor: slope, too clayey.

[1]This map unit is made up of two or more dominant kinds of soil. See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 16.--WATER MANAGEMENT

[Some terms that describe restrictive soil features are defined in the Glossary. Absence of an entry indicates that the soil was not evaluated]

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
Absarokee:						
1	Slope, depth to rock.	Thin layer, low strength, shrink-swell.	Slope, depth to rock.	Slope, rooting depth, erodes easily.	Depth to rock--	Depth to rock, slope.
[1]2:						
Absarokee part-	Slope, depth to rock.	Thin layer, low strength, shrink-swell.	Slope, depth to rock.	Slope, rooting depth, erodes easily.	Complex slope, depth to rock.	Depth to rock, slope.
Work part	Slope----------	Hard to pack, low strength.	Slope----------	Slope----------	Slope----------	Slope.
Agua Fria:						
3	Slope, seepage.	Large stones, seepage.	Slope----------	Slope, large stones.	Large stones---	Large stones.
4	Slope, seepage.	Large stones, seepage.	Slope----------	Slope, large stones.	Slope, large stones.	Slope, large stones.
5	Seepage--------	Large stones, seepage.	Slope----------	Slope, droughty, large stones.	Large stones---	Slope, droughty, large stones.
Apishapa:						
6	Favorable------	Low strength, shrink-swell, hard to pack.	Wetness, percs slowly, excess salt.	Percs slowly, wetness, excess salt.	Percs slowly, wetness.	Percs slowly.
Aquic Natrargids:						
7.						
Ascalon:						
8	Seepage, slope.	Piping, low strength.	Slope----------	Slope, soil blowing.	Soil blowing, slope.	Slope.
Avalon:						
9	Seepage--------	Low strength---	Favorable------	Erodes easily--	Erodes easily--	Erodes easily.
10	Slope, seepage.	Low strength---	Slope----------	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
Badland:						
11.						
Beenom:						
[1]12:						
Beenom part----	Slope, depth to rock, seepage.	Thin layer, low strength.	Slope, depth to rock.	Slope, rooting depth, droughty.	Slope, depth to rock.	Slope, droughty, rooting depth.
Absarokee part-	Slope, depth to rock.	Thin layer, low strength, shrink-swell.	Slope, depth to rock.	Slope, rooting depth, erodes easily.	Slope, depth to rock.	Slope, depth to rock.
[1]13:						
Beenom part----	Slope, depth to rock, seepage.	Thin layer, low strength.	Slope, depth to rock.	Slope, rooting depth, droughty.	Slope, depth to rock.	Slope, droughty, rooting depth.
Absarokee part-	Slope, depth to rock.	Thin layer, low strength, shrink-swell.	Slope, depth to rock.	Slope, rooting depth, erodes easily.	Slope, depth to rock.	Slope, depth to rock.

See footnote at end of table.

TABLE 16.--WATER MANAGEMENT--Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
Billings:						
14	Favorable	Low strength, piping.	Percs slowly	Percs slowly, erodes easily.	Erodes easily, percs slowly.	Erodes easily.
15, 16	Slope	Low strength, piping.	Slope, percs slowly.	Slope, erodes easily, percs slowly.	Slope, erodes easily, percs slowly.	Slope, erodes easily.
Breece:						
17	Seepage, slope.	Piping, low strength.	Slope	Slope, droughty.	Favorable	Droughty.
Bulkley:						
18, 19	Slope, depth to rock.	Low strength, hard to pack.	Percs slowly, slope.	Slope, percs slowly.	Slope, percs slowly.	Slope, percs slowly.
Cerro:						
20	Slope	Shrink-swell, hard to pack.	Slope, percs slowly.	Slope, percs slowly.	Percs slowly	Percs slowly.
21	Slope	Shrink-swell, hard to pack.	Slope, percs slowly.	Slope, percs slowly.	Slope, percs slowly.	Slope, percs slowly.
22	Slope	Shrink-swell, hard to pack.	Slope, percs slowly.	Slope, percs slowly.	Slope, percs slowly.	Slope, percs slowly.
Chipeta:						
23	Slope, depth to rock.	Low strength, thin layer, piping.	Slope, depth to rock, percs slowly.	Slope, rooting depth, droughty.	Slope, erodes easily, depth to rock.	Slope, droughty, rooting depth.
Cliffdown:						
24	Seepage, slope.	Seepage, piping.	Slope	Droughty, slope.	Slope, piping, too sandy.	Droughty, slope.
Cochetopa:						
25	Slope	Large stones, low strength, hard to pack.	Slope, percs slowly.	Slope, percs slowly, large stones.	Large stones, percs slowly, slope.	Large stones, percs slowly, slope.
Colona:						
26	Slope	Hard to pack, low strength.	Percs slowly	Slope, percs slowly.	Percs slowly	Percs slowly.
27, 28	Slope	Hard to pack, low strength.	Slope, percs slowly.	Slope, percs slowly.	Slope, percs slowly.	Percs slowly, slope.
Cryoborolls:						
29.						
Curecanti:						
30	Slope, seepage.	Seepage, piping, large stones.	Slope	Slope, droughty, large stones.	Slope, large stones.	Slope, droughty, large stones.
31	Slope, seepage.	Seepage, piping, large stones.	Slope	Slope, large stones, droughty.	Slope, large stones.	Slope, droughty, large stones.
Delson:						
32, 33	Slope	Low strength, hard to pack.	Percs slowly, slope.	Percs slowly, slope.	Percs slowly, slope.	Slope, percs slowly.
34	Slope	Large stones, shrink-swell, low strength.	Slope, percs slowly.	Slope, large stones, percs slowly.	Slope, large stones, percs slowly.	Slope, percs slowly, large stones.

See footnote at end of table.

TABLE 16.--WATER MANAGEMENT--Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
Fluvaquents: 35.						
Fluvents: 36.						
Fughes: 37, 38, 39, 40	Slope	Low strength, shrink-swell.	Slope	Slope, percs slowly.	Slope, percs slowly.	Slope, percs slowly.
[1]41:						
Fughes part	Slope	Low strength, shrink-swell.	Slope	Slope, percs slowly.	Slope, percs slowly.	Slope, percs slowly.
Curecanti part	Slope, seepage.	Seepage, piping, large stones.	Slope	Slope, large stones, droughty.	Slope, piping, large stones.	Slope, droughty, large stones.
Glenton: 42	Seepage	Piping, low strength.	Favorable	Favorable	Favorable	Favorable.
43	Seepage	Piping, low strength.	Slope	Slope	Favorable	Favorable.
Gullied land: 44.						
Haplaquolls: 45.						
Kech: [1]46:						
Kech part	Depth to rock, slope.	Thin layer, low strength.	Depth to rock, slope.	Rooting depth, slope, droughty.	Depth to rock, rooting depth, slope.	Slope, droughty, rooting depth.
Progresso part	Seepage, depth to rock, slope.	Piping, thin layer.	Slope, depth to rock.	Rooting depth, slope.	Slope	Slope, depth to rock.
[1]47:						
Kech part	Depth to rock, slope.	Thin layer, low strength.	Depth to rock, slope.	Rooting depth, slope, droughty.	Depth to rock, rooting depth, slope.	Slope, droughty, rooting depth.
Rock outcrop part.						
Killpack: 48	Slope, depth to rock.	Low strength, piping, thin layer.	Slope, percs slowly, depth to rock.	Slope, percs slowly, erodes easily.	Slope, percs slowly, erodes easily.	Percs slowly.
Lazear: [1]49:						
Lazear part	Depth to rock, slope.	Thin layer, low strength.	Slope, depth to rock.	Slope, rooting depth. droughty.	Depth to rock, rooting depth, slope.	Slope, rooting depth, droughty.
Rock outcrop part.						
Limon: 50	Favorable	Hard to pack, low strength.	Percs slowly	Percs slowly	Percs slowly	Percs slowly.
51	Slope	Hard to pack, low strength.	Slope, percs slowly.	Slope, percs slowly.	Percs slowly	Percs slowly.

See footnote at end of table.

TABLE 16.--WATER MANAGEMENT--Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
Meeteetse:						
52	Slope	Low strength, hard to pack.	Excess sodium, percs slowly, slope.	Slope, excess sodium, large stones.	Slope, large stones, percs slowly.	Slope, large stones, excess sodium.
Mesa:						
53	Seepage	Favorable	Slope	Slope	Favorable	Favorable.
54	Slope, seepage.	Favorable	Slope	Slope	Favorable	Favorable.
[1]55:						
Mesa part	Seepage	Favorable	Slope	Slope	Slope	Slope.
Utaline part	Slope, seepage.	Piping, large stones.	Slope	Slope, droughty, large stones.	Slope, piping, large stones.	Slope, droughty, large stones.
Midway:						
[1]56:						
Midway part	Slope, depth to rock.	Thin layer, hard to pack, low strength.	Slope, depth to rock.	Slope, rooting depth, droughty.	Slope, depth to rock, erodes easily.	Slope, percs slowly, droughty, erodes easily.
Gaynor part	Slope, depth to rock.	Low strength, hard to pack.	Percs slowly, slope, depth to rock.	Slope, percs slowly, rooting depth.	Slope, percs slowly.	Slope, percs slowly, depth to rock.
Northwater:						
57, 58	Slope, seepage.	Low strength	Slope	Slope	Slope	Slope.
Persayo:						
59	Slope, depth to rock.	Thin layer, low strength.	Slope, depth to rock.	Slope, rooting depth. droughty.	Slope, depth to rock, erodes easily.	Slope, droughty, erodes easily.
Potts:						
60	Slope, seepage.	Low strength, piping.	Slope	Slope, erodes easily.	Favorable	Erodes easily.
Progresso:						
61	Seepage, depth to rock, slope.	Piping, thin layer.	Slope, depth to rock.	Rooting depth, slope.	Depth to rock	Depth to rock.
62	Seepage, depth to rock, slope.	Piping, thin layer.	Slope, depth to rock.	Rooting depth, slope.	Depth to rock, slope.	Slope, depth to rock.
[1]63:						
Progresso part	Seepage, depth to rock, slope.	Piping, thin layer.	Slope, depth to rock.	Rooting depth, slope.	Depth to rock	Depth to rock.
Potts part	Slope, seepage.	Low strength, piping.	Slope	Slope, erodes easily.	Favorable	Erodes easily.
Radersburg:						
64, 65	Slope, seepage.	Piping, low strength, large stones.	Slope	Slope, droughty, large stones.	Slope, large stones.	Slope, large stones.
Razor:						
66	Slope, depth to rock.	Thin layer, low strength.	Slope, depth to rock, percs slowly.	Slope, rooting depth, percs slowly.	Percs slowly	Slope, percs slowly, depth to rock.

See footnote at end of table.

TABLE 16.--WATER MANAGEMENT--Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
Rock outcrop: 67.						
Saraton: 68, 69	Slope, seepage.	Piping, thin layer.	Slope, depth to rock.	Slope, droughty, rooting depth.	Slope	Slope, droughty, depth to rock.
[1]70: Saraton part	Slope, seepage.	Piping, thin layer.	Slope, depth to rock.	Slope, droughty, rooting depth.	Slope	Slope, droughty, depth to rock.
Agua Fria part	Slope, seepage.	Large stones, seepage.	Slope	Slope, large stones.	Slope, large stones.	Slope, large stones.
Scholle: 71, 72	Slope, seepage.	Low strength	Slope	Slope	Slope	Slope.
Shavano: [1]73: Shavano part	Depth to rock, slope, seepage.	Thin layer, low strength.	Depth to rock, slope.	Complex slope, rooting depth, soil blowing.	Soil blowing	Erodes easily, slope, depth to rock.
Lazear part	Depth to rock, slope, seepage.	Thin layer, low strength.	Slope, depth to rock.	Slope, rooting depth, droughty.	Depth to rock, slope.	Slope, rooting depth, droughty.
Torriorthents: [1]74: Torriorthents part.						
Haplargids part.						
[1]75: Torriorthents part.						
Rock outcrop part.						
[1]76: Torriorthents part.						
Rock outcrop part.						
Uffens: 77	Slope, seepage.	Shrink-swell, piping.	Excess salt, excess sodium.	Excess salt, excess sodium, droughty.	Piping, percs slowly, soil blowing.	Erodes easily, droughty, excess salt.
Utaline: 78	Slope, seepage.	Piping, large stones, low strength.	Cutbanks cave	Slope, large stones, droughty.	Slope, piping, large stones.	Droughty, large stones, slope.
79	Slope, seepage.	Piping, large stones, low strength.	Slope, cutbanks cave.	Slope, droughty, large stones.	Slope, piping, large stones.	Slope, large stones, droughty.
[1]80: Utaline part	Slope, seepage.	Piping, large stones, low strength.	Slope, cutbanks cave.	Slope, droughty, large stones.	Slope, piping, large stones.	Slope, large stones, droughty.

See footnote at end of table.

TABLE 16.--WATER MANAGEMENT--Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
Utaline: [1]80: Torriorthents part.						
Work: 81	Slope	Low strength, hard to pack.	Slope	Slope, erodes easily.	Favorable	Erodes easily.
82, 83	Slope	Low strength, hard to pack.	Slope	Slope, erodes easily.	Slope	Slope, erodes easily.

[1]This map unit is made up of two or more dominant kinds of soil. See description of the map unit for composition and behavoir characteristics of the map unit.

TABLE 17.--RECREATIONAL DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Absarokee:				
1	Moderate: percs slowly.	Slight	Severe: slope.	Slight.
[1]2:				
Absarokee part	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
Work part	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
Agua Fria:				
3	Moderate: large stones, dusty, percs slowly.	Moderate: large stones, dusty.	Severe: large stones, slope.	Moderate: large stones, dusty.
4	Severe: slope.	Severe: slope.	Severe: large stones, slope.	Moderate: slope, large stones, dusty.
5	Moderate: percs slowly, too clayey, dusty.	Moderate: dusty, too clayey.	Moderate: percs slowly, too clayey, slope.	Moderate: dusty, too clayey.
Apishapa:				
6	Severe: floods.	Moderate: dusty, too clayey.	Moderate: dusty, too clayey.	Moderate: dusty, too clayey.
Aquic Natrargids:				
7.				
Ascalon:				
8	Slight	Slight	Severe: slope.	Slight.
Avalon:				
9	Moderate: dusty.	Moderate: dusty.	Moderate: dusty.	Moderate: dusty.
10	Moderate: dusty.	Moderate: dusty.	Moderate: slope, dusty.	Moderate: dusty.
Badland:				
11.				
Beenom:				
[1]12:				
Beenom part	Moderate: slope.	Moderate: slope.	Severe: slope, depth to rock.	Moderate: slope.
Absarokee part	Moderate: slope, percs slowly.	Moderate: slope.	Severe: slope.	Moderate: slope.
[1]13:				
Beenom part	Severe: slope.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.

See footnote at end of table.

TABLE 17.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Beenom:				
13:				
Absarokee part	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Billings:				
14	Moderate: dusty, too clayey, percs slowly.	Moderate: dusty, too clayey.	Moderate: dusty, too clayey, percs slowly.	Moderate: too clayey, dusty.
15, 16	Moderate: dusty, too clayey, percs slowly.	Moderate: dusty, too clayey.	Moderate: slope, too clayey, percs slowly.	Moderate: too clayey, dusty.
Breece:				
17	Slight	Slight	Moderate: slope, small stones.	Slight.
Bulkley:				
18, 19	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: too clayey, dusty.
Cerro:				
20	Moderate: percs slowly.	Slight	Moderate: percs slowly, small stones, slope.	Slight.
21	Moderate: percs slowly, slope.	Moderate: slope.	Severe: slope.	Slight.
22	Severe: slope.	Severe: slope.	Severe: slope, large stones, small stones.	Moderate: slope.
Chipeta:				
23	Severe: slope, too clayey.	Severe: slope, too clayey.	Severe: slope, depth to rock, too clayey.	Severe: too clayey.
Cliffdown:				
24	Moderate: dusty.	Moderate: dusty.	Severe: slope, small stones.	Moderate: dusty.
Cochetopa:				
25	Severe: slope.	Severe: slope.	Severe: slope, large stones, small stones.	Severe: slope.
Colona:				
26	Moderate: too clayey, percs slowly, dusty.	Moderate: too clayey, dusty.	Moderate: slope, percs slowly, too clayey.	Moderate: too clayey, dusty.
27	Moderate: slope, too clayey, percs slowly.	Moderate: slope, too clayey, dusty.	Severe: slope.	Moderate: too clayey, dusty.
28	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.

See footnote at end of table.

TABLE 17.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Cryoborolls: 29.				
Curecanti: 30	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
31	Severe: slope.	Severe: slope.	Severe: small stones, large stones, slope.	Moderate: slope.
Delson: 32	Moderate: percs slowly.	Slight	Severe: slope.	Slight.
33	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
34	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.
Fluvaquents: 35	Severe: floods, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Fluvents: 36.				
Fughes: 37	Moderate: slope, percs slowly.	Moderate: slope.	Severe: slope.	Slight.
38, 40	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
39	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
[1]41: Fughes part	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Curecanti part	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Glenton: 42	Severe: floods.	Moderate: dusty.	Moderate: dusty.	Moderate: dusty.
43	Severe: floods.	Moderate: dusty.	Moderate: slope, dusty.	Moderate: dusty.
Gullied land: 44.				
Haplaquolls: 45.				
Kech: [1]46: Kech part	Moderate: slope, dusty, percs slowly.	Moderate: slope, dusty.	Severe: slope, depth to rock.	Moderate: dusty.

See footnote at end of table.

TABLE 17.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Kech:				
146:				
Progresso part	Moderate: dusty.	Moderate: dusty.	Moderate: slope, dusty.	Moderate: dusty.
147:				
Kech part	Severe: slope.	Severe: slope.	Severe: slope, depth to rock, small stones.	Severe: slope.
Rock outcrop part.				
Killpack:				
48	Moderate: percs slowly, too clayey, dusty.	Moderate: too clayey, dusty.	Severe: slope.	Moderate: too clayey, dusty.
Lazear:				
149:				
Lazear part	Severe: slope.	Severe: slope.	Severe: depth to rock, small stones, slope.	Moderate: small stones, slope, dusty.
Rock outcrop part.				
Limon:				
50, 51	Severe: floods.	Moderate: too clayey, dusty.	Moderate: too clayey, percs slowly, dusty.	Moderate: too clayey, dusty.
Meeteetse:				
52	Moderate: percs slowly, large stones, slope.	Moderate: slope, dusty, large stones.	Severe: slope.	Moderate: dusty.
Mesa:				
53	Moderate: dusty.	Moderate: dusty.	Moderate: small stones, dusty.	Moderate: dusty.
54	Moderate: dusty.	Moderate: dusty.	Moderate: small stones, slope, dusty.	Moderate: dusty.
155:				
Mesa part.				
Utaline part	Moderate: small stones, slope, dusty.	Moderate: small stones, slope, dusty.	Severe: small stones, slope.	Moderate: small stones, dusty.
Midway:				
156:				
Midway part	Severe: slope.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.
Gaynor part	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope, dusty, too clayey.

See footnote at end of table.

TABLE 17.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Northwater:				
57	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
58	Severe: slope.	Severe: slope.	Severe: slope, large stones.	Severe: slope.
Persayo:				
59	Severe: slope.	Severe: slope.	Severe: depth to rock, slope.	Moderate: too clayey, slope, dusty.
Potts:				
60	Moderate: dusty.	Moderate: dusty.	Moderate: slope, dusty.	Moderate: dusty.
Progresso:				
61	Moderate: dusty.	Moderate: dusty.	Moderate: slope, dusty.	Moderate: dusty.
62	Moderate: slope, dusty.	Moderate: slope, dusty.	Severe: slope.	Moderate: dusty.
[1]63:				
Progresso part	Moderate: dusty.	Moderate: dusty.	Moderate: slope, dusty.	Moderate: dusty.
Potts part	Moderate: dusty.	Moderate: dusty.	Moderate: slope, dusty.	Moderate: dusty.
Radersburg:				
64	Moderate: slope, percs slowly.	Moderate: slope.	Severe: slope.	Slight.
65	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: small stones.
Razor:				
66.				
Rock outcrop:				
67.				
Saraton:				
68	Moderate: small stones, dusty.	Moderate: small stones, dusty.	Severe: small stones, slope.	Moderate: small stones, dusty.
69	Moderate: slope, small stones, dusty.	Moderate: slope, small stones, dusty.	Severe: small stones, slope.	Moderate: small stones, dusty.
[1]70:				
Saraton part	Severe: slope.	Severe: slope.	Severe: small stones, slope.	Severe: slope.
Agua Fria part	Severe: slope.	Severe: slope.	Severe: large stones, slope.	Moderate: slope, dusty, small stones.

See footnote at end of table.

TABLE 17.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Scholle:				
71	Moderate: dusty.	Moderate: dusty.	Severe: slope, small stones.	Moderate: dusty.
72	Moderate: slope, dusty.	Moderate: slope, dusty.	Severe: slope, small stones.	Moderate: dusty.
Shavano:				
[1]73:				
Shavano part	Moderate: dusty.	Moderate: dusty.	Severe: slope.	Moderate: dusty.
Lazear part	Moderate: small stones, dusty.	Moderate: small stones, dusty.	Severe: depth to rock, small stones, slope.	Moderate: small stones, dusty.
Torriorthents:				
[1]74:				
Torriorthents part.				
Haplargids part.				
[1]75:				
Torriorthents part.				
Rock outcrop part.				
[1]76:				
Torriorthents part.				
Rock outcrop part.				
Uffens:				
77	Moderate: dusty, percs slowly.	Moderate: dusty.	Moderate: slope, dusty, percs slowly.	Moderate: dusty.
Utaline:				
78	Moderate: small stones, dusty.	Moderate: small stones, dusty.	Severe: small stones, slope.	Moderate: small stones, dusty.
79	Moderate: small stones, slope, dusty.	Moderate: small stones, slope, dusty.	Severe: small stones, slope.	Moderate: small stones, dusty.
[1]80:				
Utaline part	Severe: slope.	Severe: slope.	Severe: small stones, slope.	Moderate: small stones, slope, dusty.
Torriorthents part.				
Work:				
81	Moderate: percs slowly.	Slight	Moderate: slope, percs slowly.	Slight.
82	Moderate: slope, percs slowly.	Moderate: slope.	Severe: slope.	Slight.
83	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.

[1]This map unit is made up of two or more dominant kinds of soil. See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 18.--WILDLIFE HABITAT POTENTIALS

[See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
Absarokee: 1	Fair	Good	Fair	---	---	Fair	Poor	Very poor	Fair	---	Very poor	Fair
[1]2: Absarokee part--	Poor	Fair	Fair	---	---	Fair	Very poor	Very poor	Fair	---	Very poor	Fair
Work part	Poor	Fair	Fair	---	---	Fair	Very poor	Very poor	Fair	---	Very poor	Fair
Agua Fria: 3, 4	Poor	Poor	Fair	---	---	Fair	Poor	Very poor	Poor	---	Very poor	Fair
5	Poor	Poor	Fair	---	---	Poor	Poor	Very poor	Poor	---	Very poor	Fair
Apishapa: 6	Poor	Poor	Good	---	---	Fair	Poor	Good	Poor	---	Fair	Fair
Aquic Natrargids: 7	Very poor	Very poor	Very poor	---	---	Very poor	Fair	Fair	Very poor.	---	Fair	Very poor
Ascalon: 8	Poor	Fair	Fair	---	---	Fair	Poor	Very poor	Fair	---	Very poor	Fair
Avalon: 9, 10	Very poor	Very poor	Poor	---	---	Poor	Very poor	Very poor	Very poor.	---	Very poor	Poor
Badland: 11	Very poor	Very poor	Very poor	---	---	Very poor	Very poor	Very poor	Very poor.	---	Very poor	Very poor
Beenom: [1]12: Beenom part	Poor	Poor	Fair	---	---	Poor	Very poor	Very poor	Poor	---	Very poor	Poor
Absarokee part--	Poor	Fair	Fair	---	---	Fair	Very poor	Very poor	Fair	---	Very poor	Fair
[1]13: Beenom part	Very poor	Very poor	Fair	---	---	Poor	Very poor	Very poor	Poor	---	Very poor	Fair
Absarokee part--	Very poor	Poor	Fair	---	---	Fair	Very poor	Very poor	Poor	---	Very poor	Fair
Billings: 14, 15, 16	Very poor	Very poor	Poor	---	---	Poor	Poor	Very poor	Poor	---	Very poor	Poor
Breece: 17	Poor	Fair	Fair	---	---	Fair	Poor	Very poor	Fair	---	Very poor	Fair
Bulkley: 18	Poor	Fair	Fair	---	---	Fair	Very poor	Very poor	Fair	---	Very poor	Fair

See footnote at end of table.

TABLE 18.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
Bulkley:												
19	Very poor	Very poor	Fair	---	---	Fair	Very poor	Very poor	Poor	----	Very poor	Fair
Cerro:												
20, 21	Poor	Fair	Fair	---	---	Fair	Poor	Very poor	Fair	---	Very poor	Fair
22	Very poor	Very poor	Fair	---	---	Fair	Poor	Very poor	Poor	---	Very poor	Fair
Chipeta:												
23	Very poor	Very poor	Very poor	---	---	Very poor	Very poor	Very poor	Very poor	---	Very poor	Very poor
Cliffdown:												
24	Very poor	Very poor	Poor	---	---	Poor	Very poor	Very poor	Very poor	---	Very poor	Poor
Cochetopa:												
25	Very poor	Very poor	Good	---	---	Good	Very poor	Very poor	Poor	---	Very poor	Good
Colona:												
26, 27	Poor	Fair	Fair	---	---	Fair	Very poor	Very poor	Fair	---	Very poor	Fair
28	Very poor	Very poor	Fair	---	---	Fair	Very poor	Very poor	Poor	---	Very poor	Fair
Cryoborolls:												
29	Very poor	Very poor	Fair	---	Fair	Fair	Very poor	Very poor	Poor	Fair	Very poor	---
Curecanti:												
30	Poor	Fair	Fair	---	---	Fair	Poor	Very poor	Fair	---	Very poor	Fair
31	Very poor	Very poor	Fair	---	---	Fair	Poor	Very poor	Poor	---	Very poor	Fair
Delson:												
32	Poor	Fair	Good	---	---	Good	Poor	Very poor	Fair	---	Very poor	Good
33, 34	Very poor	Very poor	Good	---	---	Good	Very poor	Very poor	Poor	---	Very poor	Good
Fluvaquents:												
35	Poor	Poor	Fair	---	---	Good	Good	Good	Poor	---	Good	Fair
Fluvents:												
36	Poor	Poor	Fair	---	---	Fair	Poor	Very poor	Poor	---	Very poor	Fair
Fughes:												
37, 38	Poor	Fair	Good	---	---	Good	Poor	Very poor	Fair	---	Very poor	Good
39, 40	Very poor	Very poor	Good	---	---	Good	Very poor	Very poor	Poor	---	Very poor	Good
[1]41:												
Fughes part	Very poor	Very poor	Good	---	---	Good	Very poor	Very poor	Poor	---	Very poor	Good
Curecanti part	Very poor	Very poor	Fair	---	---	Fair	Very poor	Very poor	Poor	---	Very poor	Fair

See footnote at end of table.

TABLE 18.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
Glenton:												
42, 43	Very poor	Very poor	Poor	---	---	Poor	Very poor	Very poor	Very poor	---	Very poor	Poor
Gullied land:												
44	Very poor	Very poor	Very poor	---	---	Very poor	Very poor	Very poor	Very poor	---	Very poor	Very poor
Haplaquolls:												
45	Poor	Poor	Fair	---	---	Fair	Fair	Fair	Poor	---	Fair	Fair
Kech:												
[1]46:												
Kech part	Poor	Poor	Poor	---	---	Fair	Very poor	Very poor	Poor	---	Very poor	Fair
Progresso part	Poor	Fair	Fair	---	---	Fair	Very poor	Very poor	Fair	---	Very poor	Fair
[1]47:												
Kech part	Very poor	Very poor	Poor	---	---	Poor	Very poor	Very poor	Very poor	---	Very poor	Poor
Rock outcrop part	Very poor	Very poor	Very poor	---	---	Very poor	Very poor	Very poor	Very poor	---	Very poor	Very poor
Killpack:												
48	Very poor	Very poor	Very poor	---	---	Poor	Poor	Very poor	Very poor	---	Very	Poor
Lazear:												
[1]49:												
Lazear part	Very poor	Very poor	Fair	---	---	Fair	Very poor	Very poor	Poor	---	Very poor	Fair
Rock outcrop part	Very poor	Very poor	Very poor	---	---	Very poor	Very poor	Very poor	Very poor	---	Very poor	Very poor
Limon:												
50, 51	Poor	Poor	Fair	---	---	Fair	Poor	Very poor	Poor	---	Very poor	Fair
Meeteetse:												
52	Very poor	Very poor	Very poor	---	---	Very poor	Very poor	Very poor	Very poor	---	Very poor	Very poor
Mesa:												
53, 54	Very poor	Very poor	Poor	---	---	Poor	Very poor	Very poor	Very poor	---	Very poor	Poor
[1]55:												
Mesa part	Very poor	Very poor	Poor	---	---	Poor	Very poor	Very poor	Very poor	---	Very poor	Poor
Utaline part	Very poor	Very poor	Poor	---	---	Poor	Very poor	Very poor	Very poor	---	Very poor	Poor
Midway:												
[1]56:												
Midway part	Very poor	Very poor	Fair	---	---	Fair	Very poor	Very poor	Poor	---	Very poor	Fair
Gaynor part	Poor	Poor	Fair	---	---	Fair	Poor	Very poor	Poor	---	Very poor	Fair

See footnote at end of table.

TABLE 18.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
Northwater:												
57	Very poor	Poor	Good	---	---	Good	Very poor	Very poor	Poor	---	Very poor	Good
58	Very poor	Very poor	Good	---	---	Good	Very poor	Very poor	Poor	---	Very poor	Good
Persayo:												
59	Very poor	Very poor	Poor	---	---	Poor	Very poor	Very poor	Very poor	---	Very poor	Poor
Potts:												
60	Poor	Fair	Fair	---	---	Fair	Very poor	Very poor	Fair	---	Very poor	Fair
Progresso:												
61, 62	Poor	Fair	Fair	---	---	Fair	Very poor	Very poor	Fair	---	Very poor	Fair
[1]63:												
Progresso part	Poor	Fair	Fair	---	---	Fair	Very poor	Very poor	Fair	---	Very poor	Fair
Potts part	Poor	Fair	Fair	---	---	Fair	Very poor	Very poor	Fair	---	Very poor	Fair
Radersburg:												
64, 65	Poor	Fair	Fair	---	---	Fair	Very poor	Very poor	Fair	---	Very poor	Fair
Razor:												
66	Poor	Fair	Fair	---	---	Fair	Very poor	Very poor	Fair	---	Very poor	Fair
Rock outcrop:												
67	Very poor	Very poor	Very poor	---	---	Very poor	Very poor	Very poor	Very poor	---	Very poor	Very poor
Saraton:												
68	Poor	Fair	Fair	---	---	Fair	Very poor	Very poor	Fair	---	Very poor	Fair
69	Very poor	Very poor	Fair	---	---	Fair	Very poor	Very poor	Poor	---	Very poor	Fair
[1]70:												
Saraton part	Very poor	Very poor	Fair	---	---	Fair	Very poor	Very poor	Poor	---	Very poor	Fair
Agua Fria part	Poor	Poor	Fair	---	---	Fair	Poor	Very poor	Poor	---	Very poor	Fair
Scholle:												
71, 72	Poor	Fair	Fair	---	---	Fair	Poor	Very poor	Fair	---	Very poor	Fair
Shavano:												
[1]73:												
Shavano part	Poor	Poor	Fair	---	---	Fair	Very poor	Very poor	Poor	---	Very poor	Fair
Lazear part	Very poor	Very poor	Fair	---	---	Fair	Very poor	Very poor	Poor	---	Very poor	Fair
Torriorthents:												
[1]74:												
Torriorthents part	Poor	Poor	Poor	---	---	Poor	Very poor	Very poor	Poor	---	Very poor	Poor

See footnote at end of table.

TABLE 18.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
Torriorthents:												
[1]74:												
Haplargids part-	Poor	Poor	Poor	---	---	Poor	Very poor	Very poor	Poor	---	Very poor	Poor
[1]75:												
Torriorthents part	Very poor	Very poor	Poor	---	---	Poor	Very poor	Very poor	Very poor	---	Very poor	Poor
Rock outcrop part	Very poor	Very poor	Very poor	---	---	Very poor	Very poor	Very poor	Very poor	---	Very poor	Very poor
[1]76:												
Torriorthents part	Very poor	Very poor	Very poor	---	---	Very poor	Very poor	Very poor	Very poor	---	Very poor	Very poor
Rock outcrop part	Very poor	Very poor	Very poor	---	---	Very poor	Very poor	Very poor	Very poor	---	Very poor	Very poor
Uffens:												
77	Very poor	Very poor	Very poor	---	---	Very poor	Poor	Very poor	Very poor	---	Poor	Very poor
Utaline:												
78, 79	Very poor	Very poor	Poor	---	---	Poor	Very poor	Very poor	Very poor	---	Very poor	Poor
[1]80:												
Utaline part	Very poor	Very poor	Poor	---	---	Poor	Very poor	Very poor	Very poor	---	Very poor	Poor
Torriorthents part	Very poor	Very poor	Poor	---	---	Poor	Very poor	Very poor	Very poor	---	Very poor	Poor
Work:												
81, 82, 83	Fair	Fair	Fair	---	---	Fair	Poor	Very poor	Fair	---	Very poor	Fair

[1]This map unit is made up of two or more dominant kinds of soil. See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 19.--ENGINEERING PROPERTIES AND CLASSIFICATIONS

[The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated. NP means nonplastic]

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Absarokee:											
1	0-7	Loam	CL, CL-ML	A-4, A-6	0-5	95-100	95-100	85-95	65-75	25-35	5-15
	7-30	Clay, clay loam, channery clay loam.	CL, CH, SC	A-7	0-5	75-95	50-95	45-95	35-70	45-60	20-35
	30	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
12:											
Absarokee part--	0-7	Loam	CL, CL-ML	A-4, A-6	0-5	95-100	95-100	85-95	65-75	25-35	5-15
	7-30	Clay, clay loam, channery clay loam.	CL, CH, SC	A-7	0-5	75-95	50-85	45-80	35-70	45-60	20-35
	30	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Work part	0-6	Loam	CL, CL-ML	A-6, A-4	0-10	90-100	90-100	85-95	60-75	25-35	5-15
	6-39	Clay, clay loam	CL, CH	A-7	0-10	90-100	90-100	90-100	75-90	40-55	20-30
	39-60	Gravelly clay loam, gravelly loam.	CL, CL-ML, GC, GM-GC	A-4, A-6	0-10	60-90	50-85	45-80	35-70	25-40	5-20
Agua Fria:											
3, 4	0-2	Stony loam	CL, CL-ML	A-6, A-4	5-15	80-100	75-100	60-85	50-65	20-35	5-15
	2-24	Clay loam, clay, stony clay loam.	CL	A-6	5-40	75-90	75-90	70-85	55-70	25-40	10-20
	24-34	Cobbly loam, stony loam.	CL-ML, GM-GC	A-4	25-40	65-85	60-80	50-65	40-60	20-30	5-10
	34-60	Very cobbly loam, very stony loam.	GM, GP-GM	A-1, A-2	50-60	25-60	20-55	15-45	10-35	20-25	NP-5
5	0-2	Clay loam	CL	A-7, A-6	0	100	95-100	95-100	75-85	30-50	15-30
	2-24	Clay loam, clay, stony clay loam.	CL	A-6	5-40	75-90	75-90	70-80	55-70	25-40	10-20
	24-34	Cobbly loam, stony loam.	CL-ML, GM-GC	A-4	25-40	65-85	60-80	50-65	40-60	20-30	5-10
	34-60	Very cobbly loam, very stony loam.	GM, GP-GM	A-1, A-2	50-60	25-60	20-55	15-45	10-35	20-25	NP-5
Apishapa:											
6	0-9	Silty clay loam	CL	A-6	0	95-100	95-100	90-100	70-85	30-40	15-25
	9-60	Clay, silty clay, silty clay loam.	CL, CH	A-7	0	95-100	95-100	90-100	75-95	40-60	20-40
Aquic Natrargids:											
7.											
Ascalon:											
8	0-8	Sandy loam	SM	A-2, A-4	0	95-100	90-100	70-95	25-50	15-25	NP-5
	8-34	Sandy clay loam	SC, CL	A-6	0	95-100	90-100	80-100	40-55	20-40	10-20
	34-60	Sandy loam, fine sandy loam.	SC, SM-SC, CL, CL-ML	A-4	0-5	85-100	85-100	70-90	35-55	20-30	5-15

See footnote at end of table.

TABLE 19.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Avalon:											
9, 10	0-9	Loam	CL-ML	A-4	0	100	90-100	70-80	50-70	20-30	5-10
	9-60	Loam	CL-ML	A-4	0-5	85-95	80-100	65-85	50-70	20-30	5-10
Badland:											
11.											
Beenom:											
[1]12:											
Beenom part	0-4	Loam	CL-ML	A-4	0-10	85-100	85-100	85-95	50-70	20-30	5-10
	4-14	Clay loam, gravelly clay loam, channery loam.	CL, SC	A-6	0-10	55-95	55-95	50-90	40-75	25-35	10-15
	14	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Absarokee part	0-7	Loam	CL-ML, CL	A-6, A-4	0-5	95-100	95-100	85-95	65-75	25-35	5-15
	7-30	Clay, clay loam, channery clay loam.	CL, CH, SC	A-7	0-5	75-95	50-95	45-95	35-90	45-60	20-35
	30	Weathered bedrock.	---	---	---	---	---	---	---	---	---
[1]13:											
Beenom part	0-4	Loam	CL-ML	A-4	0-10	85-100	85-100	85-95	50-70	20-30	5-10
	4-14	Clay loam, gravelly clay loam, channery loam.	CL, SC	A-6	0-10	55-100	55-100	50-90	40-75	25-35	10-15
	14	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Absarokee part	0-7	Loam	CL-ML, CL	A-6, A-4	0-5	95-100	95-100	85-95	65-75	25-35	5-15
	7-30	Clay, clay loam, channery clay loam.	CL, CH, SC	A-7	0-5	75-95	50-95	45-95	35-90	45-60	20-35
	30	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Billings:											
14, 15, 16	0-60	Silty clay loam	CL	A-6	0	100	100	95-100	90-95	30-40	10-20
Breece:											
17	0-19	Loam	SM, ML	A-4	0-5	80-100	75-95	65-85	40-65	15-30	NP-5
	19-60	Sandy loam, gravelly sandy loam.	SM	A-1, A-2	0-5	70-100	60-85	40-60	20-35	---	NP
Bulkley:											
18, 19	0-3	Clay loam	CL	A-7, A-6	0	100	95-100	95-100	75-95	30-50	15-30
	3-45	Silty clay, clay	CH	A-7	0-10	100	95-100	90-100	90-95	55-70	30-45
	45-60	Silty clay loam, silty clay.	CL, CH	A-7	0-10	100	95-100	80-100	60-85	40-60	20-40
Cerro:											
20, 21	0-6	Loam	CL	A-6, A-7	0-5	90-100	80-100	70-95	60-80	25-50	10-30
	6-31	Clay, clay loam	CH, CL	A-7	0-5	90-100	90-100	90-100	75-95	40-70	20-45
	31-60	Clay, gravelly clay loam, gravelly clay.	CL, CH	A-6, A-7	0-10	80-100	70-100	70-95	60-85	35-60	15-40
22	0-6	Stony loam	CL	A-6, A-7	5-25	80-90	75-90	70-95	60-80	25-50	10-30
	6-31	Clay, stony clay loam, clay loam.	CH, CL	A-7	5-25	90-100	90-100	90-100	75-95	40-70	20-45
	31-60	Clay, gravelly clay loam, gravelly clay.	CL, CH	A-6, A-7	5-15	90-100	70-100	70-95	60-85	35-60	15-40

See footnote at end of table.

TABLE 19.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Chipeta:											
23	0-15	Silty clay	CL, ML	A-6, A-7	0	100	100	95-100	90-95	35-45	10-20
	15	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Cliffdown:											
24	0-9	Gravelly loam	SM	A-4	0-5	70-80	65-75	55-65	40-50	---	NP
	9-60	Stratified very gravelly sandy loam to very gravelly loamy sand.	GP-GM, GM	A-1	0-5	30-60	20-55	20-40	5-25	---	NP
Cochetopa:											
25	0-18	Stony loam	ML	A-4	5-30	95-100	80-95	70-80	50-60	20-35	NP-10
	18-60	Clay, stony clay, stony clay loam.	CL, CH	A-7	5-30	70-90	60-90	55-85	50-80	40-60	20-40
Colona:											
26, 27, 28	0-3	Silty clay loam	CL	A-6	0	90-100	85-100	80-95	75-90	30-40	10-20
	3-60	Silty clay, clay, silty clay loam.	CH, CL	A-7, A-6	0	90-100	80-100	80-100	75-95	35-60	15-40
Cryoborolls:											
29.											
Curecanti:											
30	0-13	Loam	SM, ML	A-4	0-10	75-100	75-95	65-75	45-60	15-25	NP-5
	13-42	Very cobbly clay loam, very gravelly clay loam.	SC, GC	A-2, A-6	30-70	40-75	35-70	30-60	15-45	25-35	10-20
	42-60	Very stony loam, cobbly fine sandy loam.	GM, ML	A-4	25-40	60-80	60-80	60-75	35-60	15-25	NP-5
31	0-13	Stony loam	SM-SC, CL-ML	A-4	10-20	75-95	60-85	55-75	45-55	20-30	5-10
	13-42	Very cobbly clay loam, very gravelly clay loam.	SC, GC	A-2, A-6	30-70	40-75	35-70	30-60	15-45	25-35	10-20
	42-60	Very stony loam, cobbly fine sandy loam.	GM, ML	A-4	25-40	60-80	60-80	60-75	45-60	15-25	NP-5
Delson:											
32	0-8	Loam	CL-ML	A-4	0-5	85-95	85-95	70-95	50-75	20-30	5-10
	8-42	Clay loam, clay	CL, CH	A-6, A-7	5-25	85-100	85-100	75-100	65-85	35-55	15-30
	42-60	Stony clay loam, stony loam.	CL-ML, GM-GC	A-4	15-25	65-90	65-90	45-60	40-55	20-30	5-10
33	0-8	Stony loam	CL-ML	A-4	5-15	85-95	85-95	70-90	50-70	20-30	5-10
	8-42	Clay loam, clay	CL, CH	A-6, A-7	5-25	85-100	85-100	75-100	65-85	35-55	15-30
	42-60	Stony clay loam, stony loam.	CL-ML, GM-GC	A-4	15-25	65-90	65-90	45-60	40-55	20-30	5-10
34	0-8	Very stony loam	CL-ML	A-4	15-50	85-95	85-95	70-90	50-70	20-30	5-10
	8-42	Stony clay loam, stony clay.	CL	A-6, A-7	10-25	85-95	85-95	80-90	60-85	35-50	15-30
	42-60	Stony clay loam, very stony clay loam.	CL	A-6, A-7	10-50	80-95	80-95	75-90	55-80	25-45	15-25

See footnote at end of table.

TABLE 19.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Fluvaquents:											
35----------	0-60	Variable--------	---	---	---	---	---	---	---	---	---
Fluvents:											
36----------	0-60	Variable--------	---	---	---	---	---	---	---	---	---
Fughes:											
37, 38, 39--------	0-5	Loam------------	ML, SM	A-4	0-5	90-100	80-100	70-95	45-75	20-40	NP-10
	5-60	Clay, clay loam	CL	A-7, A-6	0-5	90-100	80-100	75-100	60-95	35-50	15-30
40----------	0-5	Stony loam------	ML, SM	A-4	5-25	85-95	80-95	70-90	40-75	20-40	NP-10
	5-60	Clay, clay loam	CL	A-7, A-6	0-5	90-100	80-100	75-100	60-95	35-50	15-30
Fughes:											
[1]41:											
Fughes part-----	0-5	Stony loam------	ML, SM	A-4	5-25	85-95	80-95	70-90	40-75	20-40	NP-10
	5-60	Clay, clay loam	CL	A-7, A-6	0-5	90-100	80-100	75-100	60-95	35-50	15-30
Curecanti part--	0-13	Stony loam------	SM-SC, CL-ML	A-4	15-25	75-95	60-85	55-75	45-55	20-30	5-10
	13-42	Very cobbly clay loam, very gravelly clay loam.	SC, GC	A-2, A-6	30-70	40-75	35-70	30-60	15-45	25-35	10-20
	42-60	Very stony loam, cobbly fine sandy loam.	GM, ML	A-4	25-40	60-80	60-80	60-75	35-60	15-25	NP-5
Glenton:											
42----------	0-5	Fine sandy loam	ML, SM	A-4	0	95-100	95-100	85-95	40-60	15-20	NP-5
	5-60	Sandy loam, fine sandy loam.	SM	A-2, A-4	0	95-100	90-100	60-70	30-50	---	NP
43----------	0-5	Loam------------	ML	A-4	0	95-100	85-100	85-95	50-60	15-20	NP-5
	5-60	Sandy loam, fine sandy loam.	SM	A-2, A-4	0	95-100	80-100	60-70	30-50	---	NP
Gullied land:											
44.											
Haplaquolls:											
45.											
Kech:											
[1]46:											
Kech part-------	0-4	Loam------------	ML	A-4	0-5	80-100	75-95	60-90	50-65	---	NP
	4-19	Clay loam, gravelly clay loam, channery loam.	GC, CL	A-6, A-7	0-5	55-95	50-90	45-90	40-85	25-45	10-25
	19	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Progresso part--	0-5	Loam------------	CL-ML	A-4	0	100	100	85-95	60-75	20-30	5-10
	5-30	Sandy clay loam, clay loam.	SM-SC, SC, CL-ML, CL	A-4, A-6	0	85-100	75-95	70-90	40-70	25-35	5-15
	30	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
[1]47:											
Kech part-------	0-4	Channery loam---	SM, GM	A-4	0-30	60-85	50-75	45-70	35-50	20-30	NP-5
	4-19	Clay loam, gravelly clay loam, channery loam.	GC, CL	A-6, A-7	0-5	55-95	50-90	45-90	40-85	25-45	10-25
	19	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 19.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Kech:											
147:											
Rock outcrop part.											
Killpack:											
48----------	0-26	Silty clay loam	CL	A-6	0	100	100	95-100	85-95	30-40	10-20
	26	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Lazear:											
149:											
Lazear part-----	0-4	Gravelly loam---	ML, GM	A-2, A-4	0-5	50-80	50-75	40-65	30-55	20-30	NP-5
	4-14	Gravelly loam, loam.	ML, GM	A-2, A-4	0-5	50-95	50-95	40-90	30-70	20-30	NP-5
	14	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop part.											
Limon:											
50, 51----------	0-4	Silty clay loam	CL	A-6, A-7	0	100	95-100	95-100	70-90	30-50	15-30
	4-60	Silty clay, silty clay loam.	CH, CL	A-7	0	100	95-100	95-100	80-95	40-60	20-40
Meeteetse:											
52----------	0-2	Stony loam------	CL	A-6, A-7	15-30	90-100	90-100	85-95	60-75	30-45	10-20
	2-16	Clay, stony clay	CH, CL	A-7	5-30	95-100	95-100	90-100	75-95	45-60	25-35
	16-60	Clay loam, stony clay loam.	CL, CL-ML	A-4, A-6	5-30	95-100	95-100	85-95	50-75	25-40	5-20
Mesa:											
53, 54----------	0-4	Loam----------	ML, SM	A-4	0-5	75-100	75-95	65-90	45-75	20-35	NP-10
	4-20	Clay loam, loam	CL, SC	A-6	0-10	75-100	75-95	65-90	45-75	30-40	15-20
	20-60	Very gravelly loam.	GM-GC	A-2, A-1	10-25	15-60	15-50	15-50	10-35	20-30	5-10
155:											
Mesa part-------	0-4	Loam----------	ML, SM	A-4	0-5	75-100	75-95	65-90	45-75	20-35	NP-10
	4-20	Clay loam, loam	CL, SC	A-6	0-10	75-100	75-95	65-90	45-75	30-40	15-20
	20-60	Very gravelly loam, gravelly loam.	GM-GC	A-2, A-1	10-25	15-60	15-60	15-50	10-35	20-30	5-10
Utaline part----	0-4	Stony loam------	ML, GM, SM	A-2, A-4	10-20	60-90	50-90	40-85	30-65	---	NP
	4-60	Very cobbly loam, very cobbly clay loam.	ML, GM	A-2, A-4	25-75	50-75	50-75	40-70	30-55	30-40	NP-10
Midway:											
156:											
Midway part-----	0-16	Silty clay loam	CL, CH	A-6, A-7	0	100	100	90-100	80-95	45-60	20-35
	16	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Gaynor part-----	0-4	Silty clay loam	CL	A-7, A-6	0	95-100	95-100	95-100	70-90	30-50	15-30
	4-30	Silty clay loam, silty clay, clay.	CL, CH	A-7	0	95-100	95-100	95-100	75-95	40-60	20-40
	30	Weathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 19.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Northwater:											
57	0-11	Loam	ML, SM	A-4	0-5	75-95	75-95	65-90	40-70	25-35	NP-5
	11-25	Loam, clay loam	CL-ML, CL, SM-SC, SC	A-4, A-6	0-10	75-95	75-95	65-90	40-70	25-35	NP-15
	25-44	Very cobbly clay loam, very gravelly clay loam.	GC, CL, SC	A-2, A-6	20-40	45-85	40-60	35-75	25-55	25-35	10-15
	44-60	Very cobbly loam, very cobbly clay loam, very gravelly loam.	GM-GC, SM-SC	A-2, A-4	30-40	35-75	30-70	25-60	20-50	20-30	5-10
58	0-11	Cobbly loam	ML	A-4	5-40	75-95	75-95	65-90	50-70	25-35	NP-5
	11-25	Cobbly clay loam, very cobbly clay loam.	CL	A-6	5-40	75-95	75-95	65-90	50-75	25-35	10-15
	25-50	Very cobbly clay loam.	GC, SC	A-2, A-6	30-40	40-80	40-80	35-75	25-50	25-35	10-15
	50-60	Very cobbly loam	GM-GC, SM-SC	A-2, A-4	30-40	35-75	30-70	25-60	20-50	20-30	5-10
Persayo:											
59	0-15	Silty clay loam	CL	A-6	0-10	85-100	80-100	80-95	60-85	25-40	10-20
	15	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Potts:											
60	0-6	Loam	ML	A-4	0	75-100	75-100	65-90	50-70	20-35	NP-5
	6-16	Clay loam, loam	CL	A-6	0	75-100	75-100	70-100	55-80	25-40	10-15
	16-60	Loam, clay loam	ML	A-4	0	75-100	75-100	65-90	50-70	20-35	NP-10
Progresso:											
61, 62	0-5	Loam	CL-ML	A-4	0	100	100	85-95	60-75	20-30	5-10
	5-30	Sandy clay loam, clay loam.	SM-SC, SC, CL-ML, CL	A-4, A-6	0	85-100	75-95	70-90	40-70	25-35	5-15
	30	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
[1]63:											
Progresso part--	0-5	Loam	CL-ML	A-4	0	100	100	85-95	60-75	20-30	5-10
	5-30	Sandy clay loam, clay loam.	SM-SC, SC, CL-ML, CL	A-4, A-6	0	85-100	75-95	70-90	40-70	25-35	5-15
	30	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Potts part	0-6	Loam	ML	A-4	0	75-100	75-100	65-90	50-70	20-35	NP-5
	6-16	Clay loam, loam	CL	A-6	0	75-100	75-100	70-100	55-80	25-40	10-15
	16-60	Loam, clay loam	ML	A-4	0	75-100	75-100	65-90	50-70	20-35	NP-10
Radersburg:											
64	0-5	Loam	ML	A-4	0-10	85-100	85-100	85-90	65-75	30-35	5-10
	5-21	Very gravelly clay loam.	CL, GC	A-6, A-2	20-40	50-90	35-60	30-60	25-55	30-40	15-20
	21-60	Cobbly loam, very gravelly loam.	GM, ML, SM	A-4	20-30	65-85	50-75	45-70	35-55	30-35	5-10

See footnote at end of table.

TABLE 19.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Radersburg:											
65	0-5	Cobbly loam	GM, ML, SM	A-4	10-20	65-85	60-75	45-70	35-55	30-35	5-10
	5-21	Very gravelly clay loam.	CL, GC	A-6, A-2	30-50	50-90	35-60	30-60	25-55	30-40	15-20
	21-60	Cobbly loam, very gravelly loam.	GM, ML, SM	A-4	20-30	65-85	50-75	45-70	35-55	30-35	5-10
Razor:											
66	0-3	Silty clay loam	CL	A-6	0	100	100	90-100	75-85	30-40	10-20
	3-26	Clay, silty clay loam, silty clay.	CL	A-6	0	100	100	90-100	75-85	30-40	10-20
	26	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop: 67.											
Saraton:											
68	0-5	Gravelly loam	ML, GM, SM	A-2, A-4	5-10	60-85	50-85	30-65	25-55	20-30	NP-5
	5-30	Very gravelly loam, very gravelly clay loam, cobbly loam.	GM	A-1, A-2	10-25	40-60	20-50	20-45	10-35	20-35	NP-10
	30	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Saraton:											
69	0-5	Stony loam	GM, ML, SM	A-2, A-4	10-20	60-80	55-80	45-70	30-60	20-30	NP-5
	5-30	Very gravelly loam, very gravelly clay loam, cobbly loam.	GM	A-1, A-2	10-25	40-60	20-50	20-45	10-35	20-35	NP-10
	30	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
[1]70:											
Saraton part	0-5	Stony loam	GM, ML, SM	A-2, A-4	10-20	60-80	55-80	45-70	30-60	20-30	NP-5
	5-30	Very gravelly loam, very gravelly clay loam, cobbly loam.	GM	A-1, A-2	10-25	40-60	20-50	20-45	10-35	20-35	NP-10
	30	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Agua Fria part	0-2	Stony loam	CL-ML	A-6, A-4	5-15	80-100	75-100	60-85	50-65	20-30	5-10
	2-24	Stony clay loam, clay loam, clay	CL	A-6	5-20	75-90	75-90	70-85	55-70	25-40	10-20
	24-34	Cobbly loam, stony loam.	CL-ML, GM-GC	A-4	25-40	65-85	60-80	50-65	40-60	20-30	5-10
	34-60	Very cobbly loam, very stony loam.	GM	A-1, A-2	50-60	25-60	20-55	15-45	10-35	20-25	NP-5
Scholle:											
71, 72	0-4	Stony loam	ML	A-4	5-15	80-100	75-100	70-95	55-75	20-25	NP-5
	4-20	Gravelly clay loam.	GC, CL	A-6	0-10	60-80	50-75	50-75	40-60	30-40	10-15
	20-60	Cobbly loam, gravelly loam.	GM-GC, CL-ML	A-4	5-20	60-80	55-75	50-70	35-55	20-30	5-10

See footnote at end of table.

TABLE 19.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Shavano:											
[1]73:											
Shavano part----	0-14	Fine sandy loam	ML, SM	A-4	0-5	80-100	75-100	70-80	40-60	15-30	NP-5
	14-26	Sandy clay loam, gravelly sandy clay loam.	SM-SC, SC, CL-ML, CL	A-4, A-6	0-5	75-100	65-100	60-80	35-55	15-30	5-15
	26	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Lazear part-----	0-4	Gravelly loam---	ML, GM	A-2, A-4	0-5	50-80	50-75	40-65	30-55	20-30	NP-5
	4-14	Gravelly loam, loam.	ML, GM	A-2, A-4	0-5	50-95	50-95	40-90	30-70	20-30	NP-5
	14	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Torriorthents:											
[1]74:											
Torriorthents part.											
Haplargids part.											
[1]75, [1]76:											
Torriorthents part.											
Rock outcrop part.											
Uffens:											
77----------	0-3	Sandy loam------	SM-SC	A-4	0	100	100	75-95	35-50	20-30	5-10
	3-14	Sandy clay loam, sandy loam.	SM-SC, SC, CL, CL-ML	A-4, A-6	0	100	100	80-90	40-60	25-35	5-15
	14-60	Sandy loam, sandy clay loam, loam.	SM, ML	A-4	0	100	100	70-85	40-60	20-30	NP-5
Utaline:											
78----------	0-4	Sandy loam------	SM	A-2, A-4	0-15	75-90	75-90	40-80	30-50	---	NP
	4-60	Very cobbly loam, very cobbly clay loam.	ML, GM	A-2, A-4	25-75	50-75	50-75	40-70	30-55	20-30	NP-5
79----------	0-4	Stony loam------	ML, GM	A-2, A-4	10-20	60-90	50-90	40-85	30-65	---	NP
	4-60	Very cobbly loam, very cobbly clay loam.	ML, GM	A-2, A-4	25-75	50-75	50-75	40-70	30-55	20-30	NP-5
[1]80:											
Utaline part----	0-4	Stony loam------	ML, GM	A-2, A-4	10-20	60-90	50-90	40-85	30-65	---	NP
	4-60	Very cobbly loam, very cobbly clay loam.	ML, GM	A-2, A-4	25-75	50-75	50-75	40-70	30-55	20-30	NP-5
Torriorthents part.											
Work:											
81, 82, 83--------	0-6	Loam----------	CL, CL-ML	A-6, A-4	0-10	90-100	90-100	85-95	60-75	25-35	5-15
	6-39	Clay, clay loam	CL, CH	A-7	0-10	90-100	90-100	90-100	75-90	40-55	20-30
	39-60	Gravelly clay loam, gravelly loam.	CL, CL-ML, GC, GM-GC	A-4, A-6	0-10	60-80	50-75	45-70	35-60	25-40	5-20

[1]This map unit is made up of two or more dominant kinds of soil. See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 20.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS

[The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" apply only to the surface layer. Absence of an entry indicates data were not available or were not estimated]

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Risk of corrosion		Erosion factors		Wind erodibility group
							Uncoated steel	Concrete	K	T	
	In	In/hr	In/in	pH	Mmhos/cm						
Absarokee:											
1----------	0-7	0.6-2.0	0.14-0.20	6.1-7.3	<2	Moderate	High-----	Low------	0.37	2	5
	7-30	0.2-0.6	0.12-0.16	6.1-8.4	<2	High------	High-----	Low------	0.32		
	30	---	---	---	---	----------	----------	----------	---		
[1]2:											
Absarokee part--	0-7	0.6-2.0	0.14-0.20	6.1-7.3	<2	Moderate	High-----	Low------	0.37	2	5
	7-30	0.2-0.6	0.12-0.16	6.1-8.4	<2	High------	High-----	Low------	0.32		
	30	---	---	---	---	----------	----------	----------	---		
Work part-------	0-6	0.6-2.0	0.14-0.20	6.6-7.8	<2	Moderate	High-----	Low------	0.37	5	5
	6-39	0.2-0.6	0.12-0.18	6.6-7.8	<2	High------	High-----	Low------	0.37		
	39-60	0.6-2.0	0.12-0.14	7.4-9.0	<4	Moderate	High-----	Low------	0.28		
Agua Fria:											
3, 4---------	0-2	0.6-2.0	0.14-0.17	7.9-8.4	<2	Moderate	High-----	Low------	0.15	5	8
	2-24	0.2-0.6	0.13-0.16	7.9-8.4	2-4	Moderate	High-----	Low------	0.28		
	24-34	0.6-2.0	0.12-0.15	7.9-8.4	2-4	Low-------	High-----	Low------	0.24		
	34-60	2.0-6.0	0.04-0.06	7.9-8.4	2-4	Low-------	High-----	Low------	0.17		
5----------	0-2	0.06-0.2	0.18-0.20	7.9-8.4	<2	Moderate	High-----	Low------	0.24	5	4L
	2-24	0.2-0.6	0.13-0.16	7.9-8.4	2-4	Moderate	High-----	Low------	0.28		
	24-34	0.6-2.0	0.12-0.15	7.9-8.4	2-4	Low-------	High-----	Low------	0.24		
	34-60	2.0-6.0	0.04-0.06	7.9-8.4	2-4	Low-------	High-----	Low------	0.17		
Apishapa:											
6----------	0-9	0.2-0.6	0.14-0.18	7.4-8.4	2-16	Moderate	High-----	Moderate	0.17	5	4
	9-60	0.06-0.2	0.10-0.14	7.9-9.0	4-16	High------	High-----	Moderate	0.17		
Aquic Natrargids:											
7.											
Ascalon:											
8----------	0-8	0.6-6.0	0.11-0.16	6.6-7.8	<2	Low-------	Low------	Low------	0.17	5	3
	8-34	0.6-2.0	0.13-0.15	6.6-7.8	<2	Moderate	Low------	Low------	0.24		
	34-60	2.0-6.0	0.11-0.15	7.4-8.4	<2	Low-------	Moderate	Low------	0.24		
Avalon:											
9, 10--------	0-9	0.6-2.0	0.16-0.18	7.4-8.4	2-8	Low-------	High-----	Moderate	0.43	3	4L
	9-60	0.6-2.0	0.15-0.17	7.4-8.4	2-8	Low-------	High-----	Moderate	0.43		
Badland:											
11.											
Beenom:											
[1]12:											
Beenom part-----	0-4	0.6-2.0	0.14-0.20	6.6-7.8	<2	Low-------	High-----	Low------	0.37	1	5
	4-14	0.6-2.0	0.10-0.18	7.4-8.4	<2	Moderate	High-----	Low------	0.32		
	14	---	---	---	---	----------	----------	----------	---		
Absarokee part--	0-7	0.6-2.0	0.12-0.18	6.1-7.3	<2	Moderate	High-----	Low------	0.32	2	5
	7-30	0.2-0.6	0.12-0.16	6.1-8.4	<2	High------	High-----	Low------	0.32		
	30	---	---	---	---	----------	----------	----------	---		
[1]13:											
Beenom part-----	0-4	0.6-2.0	0.14-0.20	6.6-7.8	<2	Low-------	High-----	Low------	0.37	1	5
	4-14	0.6-2.0	0.10-0.18	7.4-8.4	<2	Moderate	High-----	Low------	0.32		
	14	---	---	---	---	----------	----------	----------	---		
Absarokee part--	0-7	0.6-2.0	0.12-0.18	6.1-7.3	<2	Moderate	High-----	Low------	0.32	2	5
	7-30	0.2-0.6	0.12-0.16	6.1-8.4	<2	High------	High-----	Low------	0.32		
	30	---	---	---	---	----------	----------	----------	---		

See footnote at end of table.

TABLE 20.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Risk of corrosion		Erosion factors		Wind erodibility group
							Uncoated steel	Concrete	K	T	
	In	In/hr	In/in	pH	Mmhos/cm						
Billings:											
14, 15, 16	0-60	0.06-0.2	0.15-0.18	7.4-9.0	2-8	Moderate	High	High	0.43	5	4L
Breece:											
17	0-19	2.0-6.0	0.09-0.12	6.1-7.8	<2	Low	Moderate	Low	0.20	5	5
	19-60	6.0-20	0.06-0.08	6.1-7.8	<2	Low	Moderate	Low	0.15		
Bulkley:											
18, 19	0-3	0.06-0.2	0.18-0.20	6.6-8.4	<2	High	High	High	0.24	5	4L
	3-45	0.06-0.2	0.15-0.17	6.6-8.4	<2	High	High	High	0.24		
	45-60	0.06-0.2	0.15-0.17	7.9-8.4	2-8	High	High	High	0.24		
Cerro:											
20, 21, 22	0-6	0.06-0.2	0.15-0.20	6.6-7.8	<2	Moderate	High	Low	0.17	5	4
	6-31	0.06-0.2	0.13-0.16	6.6-7.8	<2	High	High	Low	0.24		
	31-60	0.06-0.2	0.13-0.16	7.9-8.4	<2	High	High	Low	0.24		
Chipeta:											
23	0-15	0.06-0.2	0.11-0.15	7.4-8.4	8-16	Moderate	High	High	0.43	1	4L
	15	---	---	---	---	---	---	---	---		
Cliffdown:											
24	0-9	0.6-2.0	0.11-0.13	7.4-9.0	<2	Low	High	Low	0.32	2	6
	9-60	2.0-6.0	0.06-0.07	7.4-8.4	<8	Low	High	High	0.20		
Cochetopa:											
25	0-18	0.6-2.0	0.13-0.16	6.6-7.3	<2	Low	High	Low	0.24	5	6
	18-60	0.06-0.2	0.11-0.14	6.1-7.8	<2	High	High	Low	0.24		
Colona:											
26, 27, 28	0-3	0.2-0.6	0.14-0.17	7.4-8.4	2-8	Moderate	High	Moderate	0.24	5	4
	3-60	0.06-0.2	0.12-0.16	7.9-9.0	2-8	High	High	Moderate	0.32		
Cryoborolls:											
29.											
Curecanti:											
30	0-13	0.6-2.0	0.12-0.15	6.1-7.3	<2	Low	Moderate	Low	0.24	5	4
	13-42	0.6-2.0	0.06-0.10	6.1-7.3	<2	Low	Moderate	Low	0.24		
	42-60	0.6-2.0	0.05-0.08	6.1-7.3	<2	Low	Moderate	Low	0.24		
31	0-13	0.6-2.0	0.06-0.10	6.1-7.3	<2	Low	Moderate	Low	0.28	5	8
	13-42	0.6-2.0	0.06-0.10	6.1-7.3	<2	Low	Moderate	Low	0.24		
	42-60	0.6-2.0	0.06-0.08	6.1-7.3	<2	Low	Moderate	Low	0.24		
Delson:											
32	0-8	0.6-2.0	0.16-0.18	6.6-7.3	<2	Low	Low	Low	0.20	5	5
	8-42	0.06-0.2	0.14-0.21	6.6-7.3	<2	High	High	Low	0.32		
	42-60	0.2-0.6	0.13-0.15	6.6-7.8	<2	Moderate	Moderate	Low	0.24		
33	0-8	0.6-2.0	0.15-0.17	6.6-7.3	<2	Low	Low	Low	0.15	5	5
	8-42	0.06-0.2	0.14-0.21	6.6-7.3	<2	High	High	Low	0.32		
	42-60	0.2-0.6	0.13-0.15	6.6-7.8	<2	Moderate	Moderate	Low	0.24		
34	0-8	0.6-2.0	0.13-0.15	6.6-7.3	<2	Low	Moderate	Low	0.15	5	8
	8-42	0.06-0.2	0.13-0.15	6.6-7.3	<2	High	Moderate	Low	0.32		
	42-60	0.2-0.6	0.13-0.15	7.4-7.8	<2	Moderate	Moderate	Low	0.24		
Fluvaquents:											
35	0-60	---	---	---	---	---	---	---	---	---	---
Fluvents:											
36	0-60	---	---	---	---	---	---	---	---	---	---
Fughes:											
37, 38, 39	0-5	0.6-2.0	0.16-0.18	6.6-7.8	<2	Low	Moderate	Low	0.20	5	5
	5-64	0.06-0.2	0.15-0.17	6.6-7.8	<2	High	High	Low	0.32		
40	0-5	0.6-2.0	0.14-0.16	6.6-7.8	<2	Low	Moderate	Low	0.17	5	8
	5-60	0.06-0.2	0.15-0.17	6.6-7.8	<2	High	High	Low	0.32		

See footnote at end of table.

TABLE 20.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete	Erosion factors: K	Erosion factors: T	Wind erodibility group
	In	In/hr	In/in	pH	Mmhos/cm						
Fughes:											
[1]41:											
Fughes part-----	0-5	0.6-2.0	0.14-0.16	6.6-7.8	<2	Low-------	Moderate	Low-------	0.17	5	8
	5-60	0.06-0.2	0.15-0.17	6.6-7.8	<2	High------	High------	Low-------	0.32		
Curecanti part--	0-13	0.6-2.0	0.06-0.10	6.1-7.3	<2	Low-------	Moderate	Low-------	0.28	5	8
	13-42	0.6-2.0	0.06-0.10	6.1-7.3	<2	Low-------	Moderate	Low-------	0.24		
	42-60	0.6-2.0	0.06-0.10	6.1-7.3	<2	Low-------	Moderate	Low-------	0.24		
Glenton:											
42, 43----------	0-5	0.6-2.0	0.16-0.18	7.9-8.4	<4	Low-------	High------	Low-------	---	---	4L
	5-60	2.0-6.0	0.11-0.13	7.9-9.0	<4	Low-------	High------	Low-------	---		
Gullied land:											
44.											
Haplaquolls:											
45.											
Kech:											
[1]46:											
Kech part-------	0-4	0.6-2.0	0.15-0.17	6.6-7.8	<2	Low-------	High------	Low-------	0.32	1	5
	4-19	0.2-0.6	0.14-0.19	6.6-7.8	<2	Moderate	High------	Low-------	0.32		
	19	---	---	---	---	----------	----------	----------	---		
Progresso part--	0-5	0.6-2.0	0.13-0.17	6.6-7.8	<2	Low-------	High------	Low-------	0.28	2	5
	5-30	0.6-2.0	0.14-0.16	7.4-8.4	<2	Moderate	High------	Low-------	0.32		
	30	---	---	---	---	----------	----------	----------	---		
[1]47:											
Kech part-------	0-4	0.6-2.0	0.13-0.15	6.6-7.8	<2	Low-------	High------	Low-------	0.28	1	8
	4-19	0.2-0.6	0.14-0.19	6.6-7.8	<2	Moderate	High------	Low-------	0.32		
	19	---	---	---	---	----------	----------	----------	---		
Rock outcrop part.											
Killpack:											
48----------	0-26	0.06-0.2	0.15-0.19	7.4-9.0	2-8	Moderate	High------	High------	0.43	2	4L
	26	---	---	---	---	----------	----------	----------	---		
Lazear:											
[1]49:											
Lazear part-----	0-4	0.6-2.0	0.14-0.16	7.9-8.4	<2	Low-------	High------	Low-------	0.20	1	6
	4-14	0.6-2.0	0.14-0.16	7.9-9.0	<2	Low-------	High------	Low-------	0.20		
	14	---	---	---	---	----------	----------	----------	---		
Rock outcrop part.											
Limon:											
50, 51----------	0-4	0.2-0.6	0.14-0.17	7.4-8.4	2-8	High------	High------	Moderate	0.24	5	4
	4-60	0.06-0.2	0.12-0.16	7.9-9.0	2-8	High------	High------	Moderate	0.32		
Meeteetse:											
52----------	0-2	0.2-0.6	0.15-0.20	7.9-9.0	<4	Moderate	High------	High------	0.32	2	4L
	2-16	0.06-0.2	0.14-0.16	>8.4	<4	High------	High------	High------	0.49		
	16-60	0.06-0.2	0.15-0.20	7.9-9.0	<4	Moderate	High------	High------	0.43		
Mesa:											
53, 54----------	0-4	0.6-2.0	0.16-0.18	7.4-8.4	2-4	Low-------	High------	Low-------	0.28	3	4L
	4-20	0.6-2.0	0.14-0.17	7.4-8.4	<8	Moderate	High------	Low-------	0.28		
	20-60	2.0-6.0	0.08-0.12	7.9-8.4	4-16	Low-------	High------	Low-------	0.10		
[1]55:											
Mesa part-------	0-4	0.6-2.0	0.16-0.18	7.4-8.4	2-4	Low-------	High------	Low-------	0.28	3	4L
	4-20	0.6-2.0	0.14-0.17	7.4-8.4	<8	Moderate	High------	Low-------	0.28		
	20-60	2.0-6.0	0.08-0.12	7.9-8.4	4-16	Low-------	High------	Low-------	0.10		

See footnote at end of table.

TABLE 20.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete	Erosion factors: K	Erosion factors: T	Wind erodibility group
	In	In/hr	In/in	pH	Mmhos/cm						
Mesa:											
155:											
Utaline part----	0-4	0.6-2.0	0.08-0.10	7.9-8.4	<2	Low--------	High------	Low-------	0.17	5	8
	4-60	0.6-2.0	0.08-0.10	7.9-9.0	<2	Low--------	High------	Moderate	0.24		
Midway:											
156:											
Midway part-----	0-16	0.06-0.2	0.12-0.17	7.4-8.4	2-8	High-------	High------	Low-------	0.43	1	4
	16	---	---	---	---	----------	---------	---------	---		
Gaynor part-----	0-4	0.2-0.6	0.14-0.17	7.4-8.4	<2	High-------	High------	Moderate	0.24	2	4
	4-30	0.06-0.2	0.12-0.16	7.9-9.0	2-8	High-------	High------	High------	0.32		
	30	---	---	---	---	----------	---------	---------	---		
Northwater:											
57----------	0-11	0.6-2.0	0.15-0.20	6.1-7.3	<2	Low--------	Moderate	Low-------	0.24	5	4
	11-25	0.6-2.0	0.16-0.20	6.1-7.3	<2	Low--------	Moderate	Low-------	0.28		
	25-44	0.6-2.0	0.10-0.13	6.1-7.3	<2	Moderate	High------	Low-------	0.32		
	44-60	0.6-2.0	0.10-0.12	6.6-7.3	<2	Low--------	High------	Low-------	0.28		
58----------	0-11	0.6-2.0	0.14-0.16	6.1-7.3	<2	Low--------	High------	Low-------	0.17	5	8
	11-25	0.6-2.0	0.14-0.16	6.1-7.3	<2	Moderate	High------	Low-------	0.24		
	25-50	0.6-2.0	0.10-0.12	6.1-7.3	<2	Moderate	High------	Low-------	0.32		
	50-60	0.6-2.0	0.10-0.12	6.6-7.3	<2	Low--------	High------	Low-------	0.28		
Persayo:											
59----------	0-15	0.2-0.6	0.15-0.19	7.9-9.0	<8	Moderate	High------	Low-------	0.37	1	4L
	15	---	---	---	---	----------	---------	---------	---		
Potts:											
60----------	0-6	0.6-2.0	0.16-0.18	6.6-7.8	<2	Low--------	High------	Moderate	0.37	5	6
	6-16	0.6-2.0	0.19-0.21	6.6-8.4	<2	Moderate	High------	Moderate	0.43		
	16-60	0.6-2.0	0.16-0.18	7.9-9.0	<2	Low--------	High------	Moderate	0.55		
Progresso:											
61, 62-------	0-5	0.6-2.0	0.13-0.17	6.6-7.8	<2	Low--------	High------	Low-------	0.28	2	5
	5-30	0.6-2.0	0.14-0.16	7.4-8.4	<2	Moderate	High------	Low-------	0.32		
	30	---	---	---	---	----------	---------	---------	---		
163:											
Progresso part--	0-5	0.6-2.0	0.13-0.17	6.6-7.8	<2	Low--------	High------	Low-------	0.28	2	5
	5-30	0.6-2.0	0.14-0.16	7.4-8.4	<2	Moderate	High------	Low-------	0.32		
	30	---	---	---	---	----------	---------	---------	---		
Potts part------	0-6	0.6-2.0	0.16-0.18	6.6-7.8	<2	Low--------	High------	Moderate	0.37	5	6
	6-16	0.6-2.0	0.19-0.21	6.6-8.4	<2	Moderate	High------	Moderate	0.43		
	16-60	0.6-2.0	0.16-0.18	7.9-9.0	<2	Low--------	High------	Moderate	0.55		
Radersburg:											
64----------	0-5	0.6-2.0	0.14-0.20	6.6-7.8	<2	Low--------	High------	Low-------	0.37	5	5
	5-21	0.2-0.6	0.09-0.12	7.4-8.4	<2	Low--------	High------	Low-------	0.28		
	21-60	0.6-2.0	0.08-0.11	7.9-9.0	<4	Low--------	High------	Low-------	0.32		
65----------	0-5	0.6-2.0	0.08-0.11	6.6-7.8	<2	Low--------	High------	Low-------	0.32	5	8
	5-21	0.2-0.6	0.09-0.12	7.4-8.4	<2	Low--------	High------	Low-------	0.28		
	21-60	0.6-2.0	0.08-0.11	7.9-9.0	<4	Low--------	High------	Low-------	0.32		
Razor:											
66----------	0-3	0.06-0.2	0.12-0.18	7.4-8.4	<2	Moderate	High------	Low-------	0.37	1	6
	3-26	0.06-0.2	0.12-0.18	7.4-8.4	<4	High-------	High------	Low-------	0.37		
	26	---	---	---	---	----------	---------	---------	---		
Rock outcrop:											
67.											
Saraton:											
68----------	0-5	0.6-2.0	0.08-0.14	7.9-8.4	<2	Low--------	High------	Low-------	0.15	5	5
	5-30	0.6-2.0	0.06-0.08	7.9-8.4	<2	Low--------	High------	Low-------	0.10		
	30	---	---	---	---	----------	---------	---------	---		

See footnote at end of table.

TABLE 20.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Risk of corrosion		Erosion factors		Wind erodibility group
							Uncoated steel	Concrete	K	T	
	In	In/hr	In/in	pH	Mmhos/cm						
Saraton:											
69----------	0-5	0.6-2.0	0.06-0.08	7.9-8.4	<2	Low-------	High-----	Low------	0.10	5	8
	5-30	0.6-2.0	0.06-0.08	7.9-8.4	<2	Low-------	High-----	Low------	0.10		
	30	---	---	---	---	----------	----------	----------	---		
[1]70:											
Saraton part----	0-5	0.6-2.0	0.06-0.08	7.9-8.4	<2	Low-------	High-----	Low------	0.10	5	8
	5-30	0.6-2.0	0.06-0.08	7.9-8.4	<2	Low-------	High-----	Low------	0.10		
	30	---	---	---	---	----------	----------	----------	---		
Agua Fria part--	0-2	0.6-2.0	0.14-0.17	7.9-8.4	<2	Moderate	High-----	Low------	0.15	5	8
	2-24	0.2-0.6	0.13-0.16	7.9-8.4	2-4	Moderate	High-----	Low------	0.28		
	24-34	0.6-2.0	0.12-0.15	7.9-8.4	2-4	Low-------	High-----	Low------	0.24		
	34-60	2.0-6.0	0.04-0.06	7.9-8.4	2-4	Low-------	High-----	Low------	0.17		
Scholle:											
71, 72----------	0-4	0.6-2.0	0.16-0.18	6.6-7.8	<2	Low-------	Moderate	Low------	0.32	3	6
	4-20	0.6-2.0	0.13-0.15	7.4-8.4	<2	Moderate	Moderate	Low------	0.24		
	20-60	0.6-2.0	0.13-0.15	7.9-8.4	<2	Low-------	High-----	Low------	0.28		
Shavano:											
[1]73:											
Shavano part----	0-14	0.6-6.0	0.11-0.16	7.9-9.0	<2	Low-------	High-----	Low------	0.32	2	3
	14-26	0.6-2.0	0.14-0.18	7.9-9.0	<2	Low-------	High-----	Low------	0.37		
	26	---	---	---	---	----------	----------	----------	---		
Lazear part-----	0-4	0.6-2.0	0.14-0.16	7.9-8.4	<2	Low-------	High-----	Low------	0.20	1	6
	4-14	0.6-2.0	0.14-0.16	7.9-9.0	<2	Low-------	High-----	Low------	0.20		
	14	---	---	---	---	----------	----------	----------	---		
Torriorthents:											
[1]74:											
Torriorthents part.											
Haplargids part.											
[1]75, [1]76:											
Torriorthents part.											
Rock outcrop part.											
Uffens:											
77----------	0-3	2.0-6.0	0.08-0.10	7.9-9.0	2-8	Low-------	High-----	High-----	0.49	1	3
	3-14	0.2-0.6	0.05-0.10	>8.4	>16	Moderate	High-----	High-----	0.24		
	14-60	2.0-6.0	0.05-0.10	>8.4	>16	Low-------	High-----	High-----	0.10		
Utaline:											
78----------	0-4	0.6-2.0	0.10-0.14	7.9-8.4	<2	Low-------	High-----	Low------	0.28	5	4
	4-60	0.6-2.0	0.08-0.10	7.9-9.0	<2	Low-------	High-----	Moderate	0.24		
79----------	0-4	0.6-2.0	0.08-0.10	7.9-8.4	<2	Low-------	High-----	Low------	0.17	5	8
	4-60	0.6-2.0	0.08-0.10	7.9-9.0	<2	Low-------	High-----	Moderate	0.24		
[1]80:											
Utaline part----	0-4	0.6-2.0	0.08-0.10	7.9-8.4	<2	Low-------	High-----	Low------	0.17	5	8
	4-60	0.6-2.0	0.08-0.10	7.9-9.0	<2	Low-------	High-----	Moderate	0.24		
Torriorthents part.											
Work:											
81, 82, 83--------	0-6	0.6-2.0	0.14-0.20	6.6-7.8	<2	Moderate	High-----	Low------	0.37	5	5
	6-39	0.2-0.6	0.12-0.18	6.6-7.8	<2	High------	High-----	Low------	0.37		
	39-60	0.6-2.0	0.12-0.14	7.4-9.0	<4	Moderate	High-----	Low------	0.28		

[1]This map unit is made up of two or more dominant kinds of soil. See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 21.--SOIL AND WATER FEATURES

[The definitions of "flooding" and "water table" in the Glossary explain terms as "rare," "brief," and "apparent." The symbol > means more than. Absence of an entry indicates that the feature is not a concern.]

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	
					Ft			In		
Absarokee: 1	C	None	---	---	>6.0	---	---	20-40	Hard	Low.
[1]2: Absarokee part-	C	None	---	---	>6.0	---	---	20-40	Hard	Low.
Work part	C	None	---	---	>6.0	---	---	>60	---	Low.
Agua Fria: 3, 4, 5	B	None	---	---	>6.0	---	---	>60	---	Low.
Apishapa: 6	C	Rare	---	---	0-3.0	Apparent	May-Aug	>60	---	Moderate.
Aquic Natrargids: 7	---	None	---	---	1.5-3.0	Apparent	May-Aug	---	---	---
Ascalon: 8	B	None	---	---	>6.0	---	---	>60	---	Moderate.
Avalon: 9, 10	B	None	---	---	>6.0	---	---	>60	---	Moderate.
Badland: 11.										
Beenom: [1]12: Beenom part	D	None	---	---	>6.0	---	---	10-20	Hard	Moderate.
Absarokee part-	C	None	---	---	>6.0	---	---	20-40	Hard	Low.
[1]13: Beenom part	D	None	---	---	>6.0	---	---	10-20	Hard	Moderate.
Absarokee part-	C	None	---	---	>6.0	---	---	20-40	Hard	Low.
Billings: 14, 15, 16	C	None	---	---	>6.0	---	---	>60	---	Moderate.
Breece: 17	B	None	---	---	3.0-6.0	---	---	>60	---	Moderate.
Bulkley: 18, 19	C	None	---	---	>6.0	---	---	40-70	Rippable	Low.
Cerro: 20, 21, 22	C	None	---	---	>6.0	---	---	>60	---	Low.
Chipeta: 23	D	None	---	---	>6.0	---	---	10-20	Rippable	Moderate.
Cliffdown: 24	B	None	---	---	>6.0	---	---	>60	---	Low.
Cochetopa: 25	C	None	---	---	>6.0	---	---	>60	---	Moderate.
Colona: 26, 27, 28	C	None	---	---	>6.0	---	---	>60	---	Low.

See footnote at end of table.

TABLE 21.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	
					Ft			In		
Cryoborolls: 29.										
Curecanti: 30, 31	B	None	---	---	>6.0	---	---	>60	---	Moderate.
Delson: 32, 33, 34	C	None	---	---	>6.0	---	---	>60	---	Low.
Fluvaquents: 35	---	Occasional	Brief	May-Jul	0-1.5	Apparent	Jun-Aug	---	---	---
Fluvents: 36	B	Rare	---	---	>6.0	---	---	>60	---	Low.
Fughes: 37, 38, 39, 40	C	None	---	---	>6.0	---	---	>60	---	Moderate.
[1]41:										
Fughes part	C	None	---	---	>6.0	---	---	>60	---	Moderate.
Curecanti part	B	None	---	---	>6.0	---	---	>60	---	Moderate.
Glenton: 42, 43	B	Rare	---	---	>6.0	---	---	>60	---	Low.
Gullied land: 44.										
Haplaquolls: 45	---	Occasional	Very brief	Nov-Jun	0-2.0	Apparent	May-Aug	---	---	---
Kech: [1]46:										
Kech part	D	None	---	---	>6.0	---	---	10-20	Hard	Low.
Progresso part	C	None	---	---	>6.0	---	---	20-40	Hard	Low.
[1]47:										
Kech part	D	None	---	---	>6.0	---	---	10-20	Hard	Low.
Rock outcrop part.										
Killpack: 48	C	None	---	---	>6.0	---	---	20-40	Rippable	Moderate.
Lazear: [1]49:										
Lazear part	D	None	---	---	>6.0	---	---	10-20	Hard	Low.
Rock outcrop part.										
Limon: 50, 51	C	Rare	---	---	>6.0	---	---	>60	---	Low.
Meeteetse: 52	C	None	---	---	>6.0	---	---	>60	---	Low.
Mesa: 53, 54	B	None	---	---	>6.0	---	---	>60	---	Low.
[1]55:										
Mesa part	B	None	---	---	>6.0	---	---	>60	---	Low.

See footnote at end of table.

TABLE 21.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	
					Ft			In		
Mesa:										
[1]55:										
Utaline part---	B	None---------	---	---	>6.0	---	---	>60	---	Low.
Midway:										
[1]56:										
Midway part----	D	None---------	---	---	>6.0	---	---	10-20	Ripable	Low.
Gaynor part----	C	None---------	---	---	>6.0	---	---	20-40	Ripable	Low.
Northwater:										
57, 58----------	B	None---------	---	---	>6.0	---	---	>60	---	Moderate.
Persayo:										
59----------	D	None---------	---	---	>6.0	---	---	10-20	Ripable	Low.
Potts:										
60----------	B	None---------	---	---	>6.0	---	---	>40	---	Low.
Progresso:										
61, 62----------	C	None---------	---	---	>6.0	---	---	20-40	Hard	Low.
[1]63:										
Progresso part-	C	None---------	---	---	>6.0	---	---	20-40	Hard	Low.
Potts part-----	B	None---------	---	---	>6.0	---	---	>60	---	Low.
Radersburg:										
64, 65----------	B	None---------	---	---	>6.0	---	---	>60	---	Low.
Razor:										
66----------	C	None---------	---	---	>6.0	---	---	20-40	Ripable	Low.
Rock outcrop:										
67.										
Saraton:										
68, 69----------	C	None---------	---	---	>6.0	---	---	20-40	Ripable	Low.
[1]70:										
Saraton part---	C	None---------	---	---	>6.0	---	---	20-40	Ripable	Low.
Agua Fria part-	B	None---------	---	---	>6.0	---	---	>60	---	Low.
Scholle:										
71, 72----------	B	None---------	---	---	>6.0	---	---	>60	---	---
Shavano:										
[1]73:										
Shavano part---	B	None---------	---	---	>6.0	---	---	20-40	Hard	Low.
Lazear part----	D	None---------	---	---	>6.0	---	---	10-20	Hard	Low.
Torriorthents:										
[1]74:										
Torriorthents part.										
Haplargids part.										

See footnote at end of table.

TABLE 21.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	
					Ft			In		
Torriorthents:										
[1]75:										
Torriorthents part.										
Rock outcrop part.										
[1]76:										
Torriorthents part.										
Rock outcrop part.										
Uffens:										
77	D	None	---	---	>6.0	---	---	>60	---	Low.
Utaline:										
78, 79	B	None	---	---	>6.0	---	---	>60	---	Low.
[1]80:										
Utaline part	B	None	---	---	>6.0	---	---	>60	---	Low.
Torriorthents part.										
Work:										
81, 82, 83	C	None	---	---	>6.0	---	---	>60	---	Low.

[1]This map unit is made up of two or more dominant kinds of soil. See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 22.--CLASSIFICATION OF THE SOILS

Soil name	Family or higher taxonomic class
Absarokee	Fine, montmorillonitic Typic Argiborolls
Agua Fria	Fine, montmorillonitic, mesic Ustollic Haplargids
Apishapa	Fine, montmorillonitic (calcareous), mesic Vertic Fluvaquents
Aquic Natrargids	Aquic Natrargids
Ascalon	Fine-loamy, mixed, mesic Aridic Argiustolls
Avalon	Fine-loamy, mixed, mesic Typic Calciorthids
Beenom	Loamy, mixed Lithic Argiborolls
Billings	Fine-silty, mixed (calcareous), mesic Typic Torrifluvents
Breece	Coarse-loamy, mixed Pachic Haploborolls
Bulkley	Fine, montmorillonitic Borollic Vertic Camborthids
Cerro	Fine, montmorillonitic Ustertic Argiborolls
Chipeta	Clayey, mixed (calcareous), mesic, shallow Typic Torriorthents
Cliffdown	Loamy-skeletal, mixed (calcareous), mesic Typic Torriorthents
Cochetopa	Fine, montmorillonitic Argic Pachic Cryoborolls
Colona	Fine, montmorillonitic, mesic Vertic Camborthids
Cryoborolls	Cryoborolls
Curecanti	Loamy-skeletal, mixed Aridic Argiborolls
Delson	Fine, montmorillonitic Typic Argiborolls
Fluvaquents	Fluvaquents
Fluvents	Fluvents
Fughes	Fine, montmorillonitic Pachic Argiborolls
Gaynor	Fine, montmorillonitic (calcareous), mesic Ustic Torriorthents
Glenton	Coarse-loamy, mixed (calcareous), mesic Typic Torrifluvents
Haplaquolls	Haplaquolls
Haplargids	Haplargids
Kech	Loamy, mixed, mesic Lithic Ustollic Haplargids
Killpack	Fine-silty, mixed (calcareous), mesic Typic Torriorthents
Lazear	Loamy, mixed (calcareous), mesic Lithic Ustic Torriorthents
Limon	Fine, montmorillonitic (calcareous), mesic Ustertic Torriorthents
Meeteetse	Fine, montmorillonitic, mesic Typic Natrargids
Mesa	Fine-loamy, mixed, mesic Typic Haplargids.
Midway	Clayey, montmorillonitic (calcareous), mesic, shallow Ustic Torriorthents
Northwater	Loamy-skeletal, mixed Cryic Pachic Paleborolls
Persayo	Loamy, mixed (calcareous), mesic, shallow Typic Torriorthents
Potts	Fine-loamy, mixed, mesic Ustollic Haplargids
Progresso	Fine-loamy, mixed, mesic Ustollic Haplargids
Radersburg	Clayey-skeletal, mixed Aridic Argiborolls
Razor	Fine, montmorillonitic, mesic Ustollic Camborthids
Saraton	Loamy-skeletal, mixed, mesic Ustollic Calciorthids
Scholle	Fine-loamy, mixed, mesic Ustollic Haplargids
Shavano	Fine-loamy, mixed (calcareous), mesic Ustic Torriorthents
Torriorthents	Torriorthents
Uffens	Fine-loamy, mixed, mesic Typic Natrargids
Utaline	Loamy-skeletal, mixed, mesic Typic Natrargids
Work	Fine, montmorillonitic Typic Argiborolls

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