United States
Department of
Agriculture

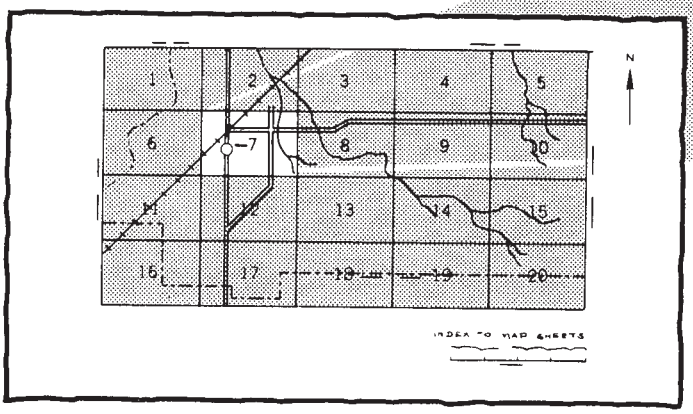
Soil
Conservation
Service

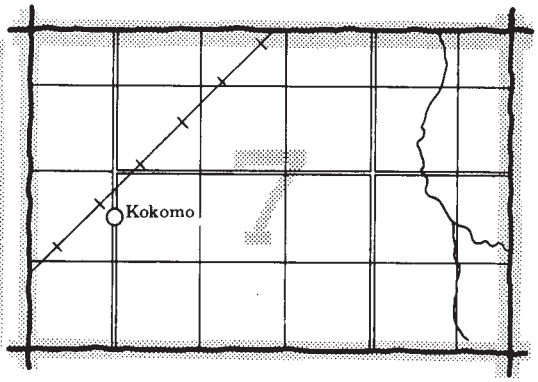
In cooperation with the
United States Department
of the Interior
Bureau of Land
Management and
Fish and Wildlife
Service, and the
Montana Agricultural
Experiment Station

Soil Survey of McCone County Montana

HOW TO USE

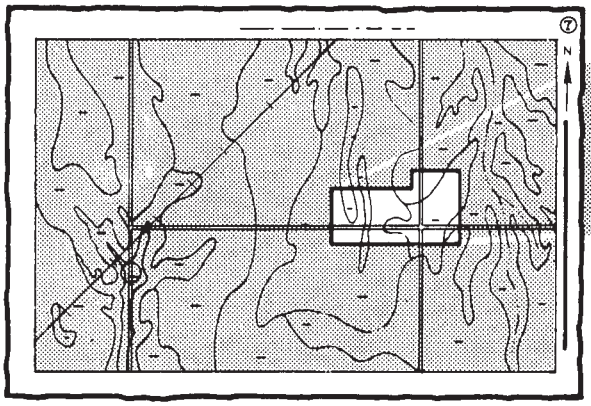
1. Locate your area of interest on the "Index to Map Sheets" (the last page of this publication).

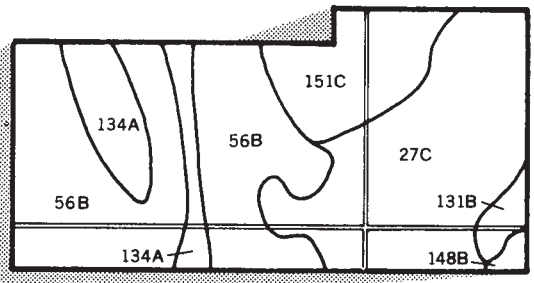




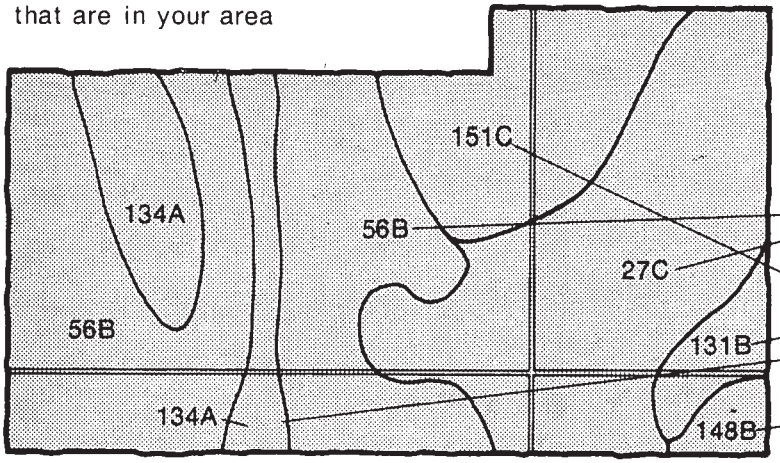
2. Note the number of the map sheet and turn to that sheet.

3. Locate your area of interest on the map sheet.





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

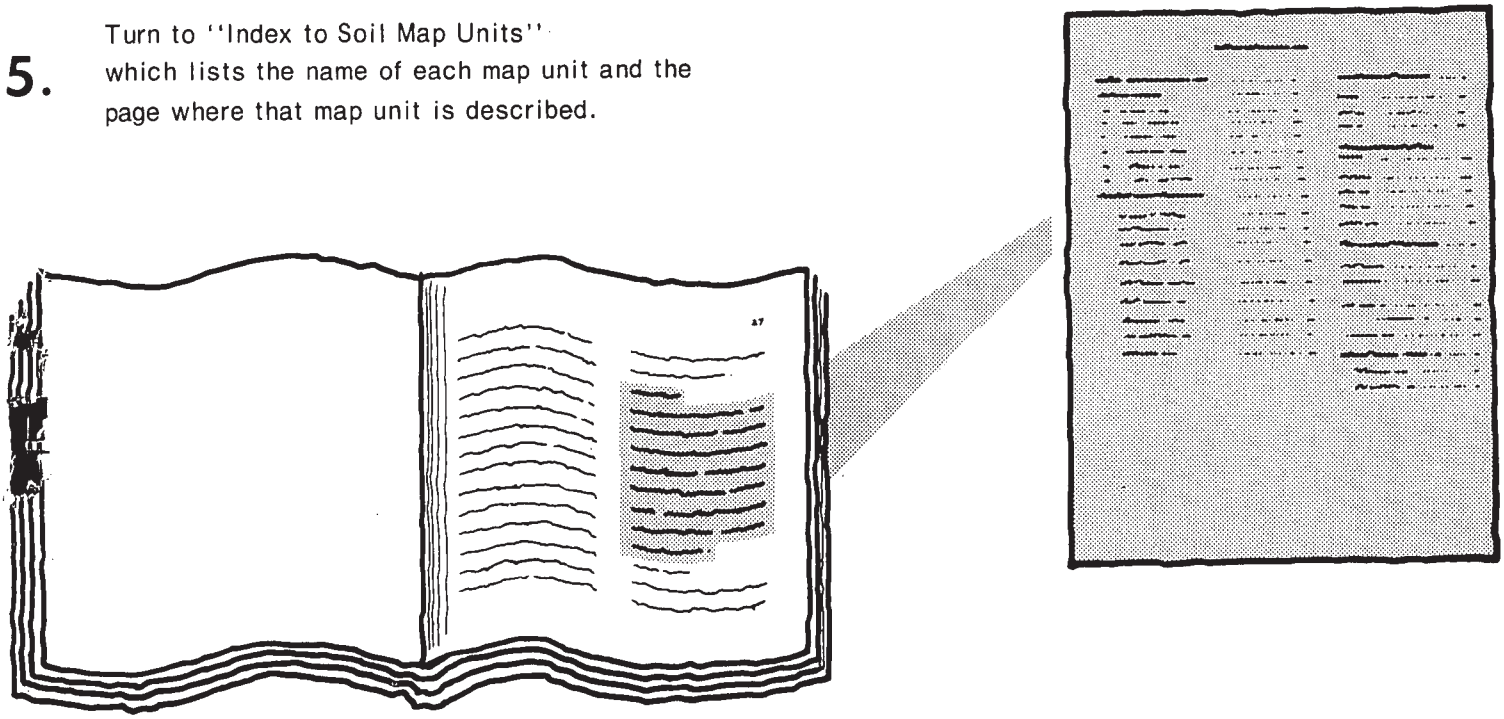


Symbols

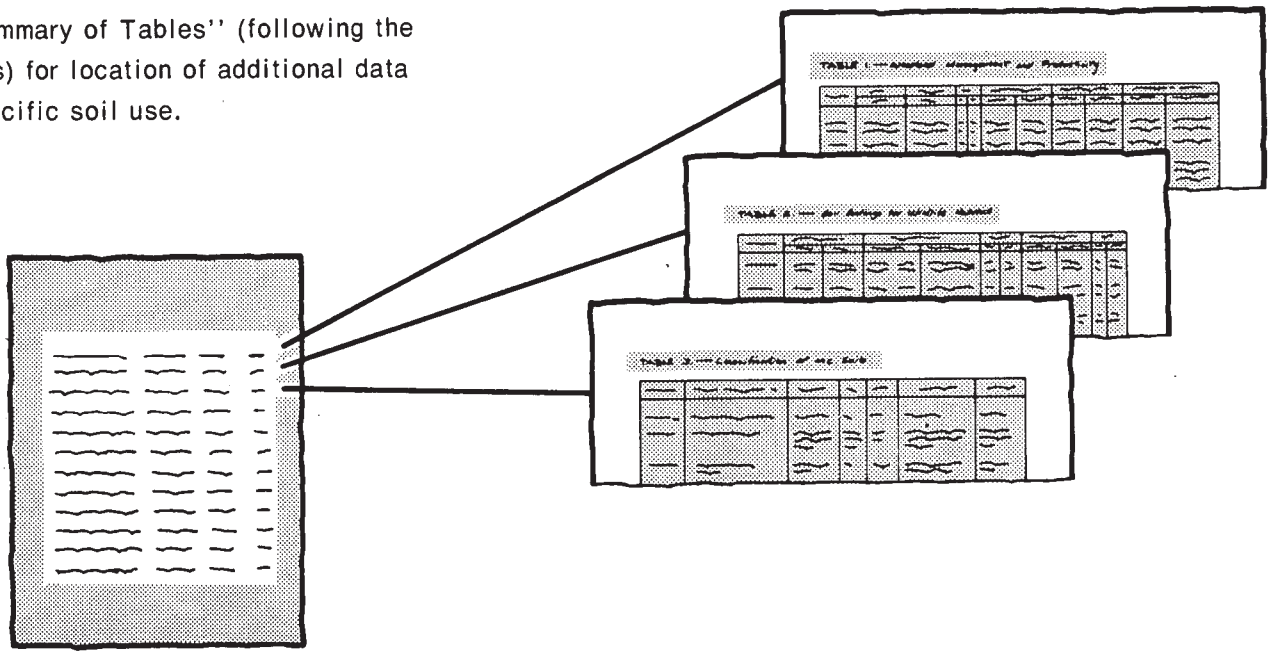
27C
56B
131B
134A
148B
151C

'HIS SOIL SURVEY

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



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



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

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

Major fieldwork for this soil survey was performed in the period 1972-79. Soil names and descriptions were approved in 1980. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1980. This survey was made cooperatively by the Soil Conservation Service, the Bureau of Land Management, the Fish and Wildlife Service, and the Montana Agricultural Experiment Station. It is part of the technical assistance furnished to the McCone County Conservation District.

Financial assistance was furnished by the Board of County Commissioners, McCone County, and by Burlington Northern Railroad, Inc.

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

Contents

Index to map units v
Summary of tables ix
Foreword xi
General nature of the survey area 1
Settlement and development 1
Ground water resources 1
Mineral resources 2
Climate 2
How this survey was made 3
General soil map units 5
Detailed soil map units 13
Detailed map unit descriptions 13
Prime farmland 163
Use and management of the soils 165
Crops and pasture 165
Rangeland 167
Woodland management and productivity 167
Windbreaks 169
Recreation 169
Wildlife habitat 170
Engineering 171
Soil properties 177
Engineering index properties 177
Physical and chemical properties 178
Soil and water features 179
Classification of the soils 181
Soil series and their morphology 181
Geology 211
References 217
Glossary 219
Tables 229

Soil Series

Absher series 181
Adger series 182
Alona series 183
Banks series 183
Barkof series 183
Bascovy series 184
Benz series 184
Blanchard series 185
Bowbells series 185
Brandenburg series 185
Bryant series 186
Bryant Variant 186
Busby series 187
Cabba series 187
Cabbart series 188
Cambert series 188
Cambeth series 189
Cherry series 189
Chinook series 190
Creed series 190
Dast series 191
Dimmick series 191
Ethridge series 192
Evanston series 192
Farland series 193
Farnuf series 193
Fleak series 193
Floweree series 194
Gerdrum series 194
Glendive series 195
Hanly series 195
Harlem series 195
Havre series 196
Havrelon series 196
Hillon series 196
Hoffmanville series 197
Kirby series 197
Kremlin series 197
Lehr series 198
Lisk series 198
Lohler series 199
Lonna series 199
Macar series 199
Marias series 200
Marvan series 200
Neldore series 201
Pendroy series 201
Ridgelawn series 201
Rominell series 202
Savage series 202
Shambo series 203
Sunburst series 203
Tally series 204
Telstad series 204
Thoeny series 205

Trembles series 205
Turner series 205
Twilight series 206
Vanda series 206
Vida series 207
Wabek series 207
Weingart series 207
Williams series 208
Yamac series 208
Yawdim series 209
Yetull series 209
Zahill series 209

Issued July 1984

Index to Map Units

1—Absher clay loam, 8 to 15 percent slopes 13
2—Adger silty clay loam, 0 to 8 percent slopes 14
3—Adger-Absher complex, 0 to 8 percent slopes..... 15
4—Aeric Fluvaquents, loamy 16
5—Alona silt loam, 0 to 8 percent slopes..... 16
6—Alona silt loam, saline, 0 to 2 percent slopes 17
7—Badland..... 17
8—Banks fine sandy loam 18
9—Barkof silty clay, 2 to 8 percent slopes 18
10—Bascovy silty clay, 2 to 8 percent slopes..... 19
11—Bascovy-Sunburst complex, 15 to 45 percent slopes..... 20
12—Benz clay loam, 0 to 8 percent slopes..... 21
13—Bowbells loam 21
14—Bryant silt loam, 0 to 4 percent slopes 22
15—Bryant silt loam, 4 to 8 percent slopes 23
16—Bryant-Cambert complex, 2 to 8 percent slopes 23
17—Bryant Variant silt loam, 0 to 2 percent slopes... 25
18—Busby fine sandy loam, 2 to 8 percent slopes.... 25
19—Busby fine sandy loam, 8 to 15 percent slopes.. 26
20—Busby-Fleak complex, 15 to 45 percent slopes.. 26
21—Busby-Twilight fine sandy loams, 2 to 8 percent slopes..... 27
22—Busby-Twilight-Fleak complex, 8 to 15 percent slopes..... 28
23—Busby-Yamac-Fleak complex, 15 to 45 percent slopes..... 29
24—Busby-Yetull fine sandy loams, 2 to 8 percent slopes..... 31
25—Cabba loam, 15 to 25 percent slopes 31
26—Cabba-Badland complex, 15 to 45 percent slopes..... 32
27—Cabba-Barkof complex, 15 to 45 percent slopes 33
28—Cabba-Brandenburg complex, 8 to 45 percent slopes..... 33
29—Cabba-Dast complex, 15 to 45 percent slopes... 34
30—Cabba-Wabek-Dast complex, 15 to 45 percent slopes..... 35
31—Cabbart silt loam, 15 to 25 percent slopes..... 36
32—Cabbart-Badland complex, 15 to 45 percent slopes..... 37
33—Cabbart-Kirby complex, 8 to 45 percent slopes.. 38
34—Cabbart-Twilight complex, 15 to 45 percent slopes..... 38
35—Cabbart-Yawdim complex, 4 to 15 percent slopes..... 39
36—Cabbart-Yawdim complex, 15 to 45 percent slopes..... 40
37—Cambert loam, 2 to 8 percent slopes..... 41
38—Cambert-Barkof-Cabba complex, 4 to 15 percent slopes 42
39—Cambert-Cabba loams, 8 to 15 percent slopes .. 44
40—Cambert-Dast-Cabba complex, 4 to 15 percent slopes..... 45
41—Cambeth silt loam, 2 to 8 percent slopes..... 46
42—Cambeth-Cabbart silt loams, 8 to 15 percent slopes..... 47
43—Cambeth-Twilight-Cabbart complex, 4 to 15 percent slopes 48
44—Cherry silt loam, 0 to 4 percent slopes 50
45—Cherry-Havrelon-Trembles complex, 0 to 2 percent slopes 51
46—Chinook fine sandy loam, 0 to 4 percent slopes 52
47—Chinook fine sandy loam, 4 to 8 percent slopes 53
48—Chinook fine sandy loam, 8 to 15 percent slopes..... 53
49—Chinook fine sandy loam, gullied, 2 to 8 percent slopes..... 54
50—Creed loam, 0 to 8 percent slopes 55
51—Creed-Gerdrum complex, 0 to 8 percent slopes. 55
52—Dast fine sandy loam, 2 to 8 percent slopes..... 57
53—Dast fine sandy loam, 8 to 15 percent slopes..... 57
54—Dast-Blanchard complex, 2 to 8 percent slopes. 58
55—Dast-Blanchard complex, 8 to 25 percent slopes..... 59
56—Dimmick silty clay..... 60
57—Dimmick clay, drained..... 61
58—Ethridge silty clay loam, 0 to 4 percent slopes ... 61
59—Ethridge silty clay loam, 4 to 8 percent slopes ... 62
60—Evanston loam, 0 to 2 percent slopes 63
61—Evanston loam, 2 to 8 percent slopes 63
62—Evanston-Gerdrum complex, 2 to 8 percent slopes..... 64
63—Farland silt loam, 0 to 4 percent slopes..... 65
64—Farnuf loam, 0 to 4 percent slopes 66
65—Floweree silt loam, 0 to 4 percent slopes..... 67
66—Floweree silt loam, 4 to 8 percent slopes..... 67
67—Floweree-Cambeth silt loams, 2 to 8 percent slopes..... 68
68—Gerdrum clay loam, 0 to 8 percent slopes 69
69—Gerdrum clay loam, gullied, 8 to 15 percent slopes..... 70
70—Gerdrum-Absher clay loams, 0 to 8 percent slopes..... 71
71—Gerdrum-Yawdim-Fleak complex, 0 to 8 percent slopes 72

72—Gerdrum-Yawdim-Fleak complex, 8 to 45 percent slopes ... 73
73—Glendive sandy loam ... 74
74—Glendive loam ... 75
75—Glendive loam, protected ... 76
76—Glendive silty clay loam ... 77
77—Glendive silty clay loam, protected ... 78
78—Glendive-Hanly complex, protected ... 79
79—Hanly loamy fine sand ... 80
80—Harlem silty clay ... 81
81—Harlem silty clay, protected ... 81
82—Havre silt loam ... 82
83—Havre silt loam, protected ... 83
84—Havre silty clay loam ... 84
85—Havre silty clay loam, protected ... 85
86—Havrelon loam ... 86
87—Havrelon loam, protected ... 87
88—Havrelon loam, saline ... 88
89—Havrelon silty clay loam ... 88
90—Havrelon silty clay loam, protected ... 89
91—Hillon loam, 2 to 8 percent slopes ... 91
92—Hillon loam, 8 to 15 percent slopes ... 91
93—Hillon loam, 15 to 45 percent slopes ... 92
94—Hillon-Badland complex, 15 to 45 percent slopes ... 93
95—Hillon-Yamac-Fleak complex, 15 to 45 percent slopes ... 93
96—Hoffmanville silty clay, protected ... 94
97—Kremlin loam, 0 to 4 percent slopes ... 95
98—Kremlin loam, 4 to 8 percent slopes ... 96
99—Lehr loam, 2 to 8 percent slopes ... 97
100—Lisk sandy loam, 2 to 8 percent slopes ... 97
101—Lisk sandy loam, 8 to 15 percent slopes ... 98
102—Lohler silty clay loam, protected ... 99
103—Lohler silty clay ... 100
104—Lohler silty clay, protected ... 100
105—Lonna silty clay loam, 0 to 4 percent slopes ... 102
106—Lonna-Havre-Glendive complex, 0 to 2 percent slopes ... 102
107—Macar loam, 0 to 4 percent slopes ... 104
108—Macar loam, 4 to 8 percent slopes ... 105
109—Macar loam, 8 to 15 percent slopes ... 105
110—Macar loam, saline, 0 to 4 percent slopes ... 106
111—Macar-Cabba loams, 8 to 15 percent slopes ... 107
112—Macar-Cambert loams, 2 to 8 percent slopes ... 108
113—Marias clay ... 109
114—Marvan clay, 0 to 8 percent slopes ... 110
115—Neldore-Badland-Bascovy complex, 15 to 45 percent slopes ... 110
116—Neldore-Bascovy complex, 2 to 15 percent slopes ... 111
117—Neldore-Yamac-Badland complex, 15 to 45 percent slopes ... 112
118—Pendroy clay ... 113
119—Ridgelawn silt loam ... 114
120—Rominell loam, 0 to 8 percent slopes ... 115
121—Rominell loam, gullied, 0 to 8 percent slopes ... 116
122—Rominell-Yamac loams, 4 to 15 percent slopes ... 116
123—Savage silty clay loam, 0 to 4 percent slopes ... 117
124—Shambo loam, 0 to 4 percent slopes ... 118
125—Shambo loam, 4 to 8 percent slopes ... 119
126—Shambo-Cabba loams, 8 to 15 percent slopes ... 120
127—Shambo-Cambert loams, 2 to 8 percent slopes ... 121
128—Sunburst clay loam, 2 to 8 percent slopes ... 122
129—Sunburst clay loam, 8 to 15 percent slopes ... 123
130—Sunburst clay loam, 15 to 45 percent slopes ... 124
131—Tally fine sandy loam, 0 to 4 percent slopes ... 124
132—Tally fine sandy loam, 4 to 8 percent slopes ... 125
133—Telstad loam, 2 to 8 percent slopes ... 125
134—Telstad-Hillon loams, 2 to 8 percent slopes ... 126
135—Telstad-Hillon loams, 8 to 15 percent slopes ... 127
136—Telstad-Thoeny loams, 2 to 8 percent slopes ... 128
137—Thoeny loam, 2 to 8 percent slopes ... 129
138—Thoeny-Absher complex, 2 to 8 percent slopes ... 130
139—Trembles fine sandy loam ... 131
140—Trembles fine sandy loam, protected ... 132
141—Turner loam, 0 to 4 percent slopes ... 133
142—Twilight-Yetull fine sandy loams, 8 to 15 percent slopes ... 134
143—Typic Fluvaquents, frequently flooded ... 135
144—Typic Fluvaquents, saline ... 135
145—Typic Ustifluvents, saline ... 135
146—Typic Ustorthents-Typic Ustifluvents association ... 136
147—Ustic Torriorthents-Ustic Torrifluvents association ... 137
148—Vanda clay, 0 to 8 percent slopes ... 138
149—Vida clay loam, 0 to 2 percent slopes ... 138
150—Vida clay loam, 2 to 8 percent slopes ... 139
151—Vida-Zahill complex, 2 to 8 percent slopes ... 140
152—Vida-Zahill complex, 8 to 15 percent slopes ... 141
153—Wabek sandy loam, 4 to 15 percent slopes ... 142
154—Wabek sandy loam, 15 to 45 percent slopes ... 142
155—Weingart clay, 2 to 8 percent slopes ... 143

156—Williams loam, 0 to 2 percent slopes 144
157—Williams loam, 2 to 4 percent slopes 144
158—Williams-Vida complex, 2 to 4 percent slopes .. 145
159—Yamac loam, 0 to 4 percent slopes 146
160—Yamac loam, 4 to 8 percent slopes 147
161—Yamac loam, 8 to 15 percent slopes 148
162—Yamac-Twilight complex, 2 to 8 percent slopes..... 148
163—Yamac-Twilight-Fleak complex, 8 to 15 percent slopes 150
164—Yawdim silty clay, 2 to 8 percent slopes..... 151
165—Yawdim-Badland-Cabbart association..... 152
166—Yawdim-Badland-Gerdrum association 153
167—Yawdim-Kirby complex, 8 to 35 percent slopes 154
168—Zahill loam, 2 to 8 percent slopes 155
169—Zahill loam, 8 to 15 percent slopes..... 155
170—Zahill loam, 15 to 45 percent slopes..... 156
171—Zahill-Badland complex, 25 to 45 percent slopes..... 157
172—Zahill-Cabba loams, 8 to 15 percent slopes..... 157
173—Zahill-Cabba loams, 15 to 45 percent slopes.... 159
174—Zahill-Yawdim complex, 4 to 15 percent slopes..... 160
175—Zahill-Yawdim complex, 15 to 45 percent slopes..... 161

Summary of Tables

Temperature and precipitation (table 1) 230

Freeze dates in spring and fall (table 2) 234
Probability. Temperature.

Growing season (table 3) 236
Probability. Length of growing season if daily minimum temperature exceeds—24 degrees F. 28 degrees F. 32 degrees F.

Acreage and proportionate extent of the soils (table 4) 237
Acres. Percent.

Yields per acre of crops (table 5) 240
Winter wheat. Spring wheat. Barley. Oats. Alfalfa hay.

Recreational development (table 6) 246
Camp areas. Picnic areas. Playgrounds. Paths and trails.

Building site development (table 7) 260
Shallow excavations. Dwellings without basements. Dwellings with basements. Small commercial buildings. Local roads and streets. Lawns and landscaping.

Sanitary facilities (table 8) 275
Septic tank absorption fields. Sewage lagoon areas. Trench sanitary landfill. Area sanitary landfill. Daily cover for landfill.

Construction materials (table 9) 290
Roadfill. Sand. Gravel. Topsoil.

Water management (table 10) 304
Limitations for—Pond reservoir areas; Embankments, dikes, and levees. Features affecting—Drainage, Irrigation, Terraces and diversions, Grassed waterways.

Engineering index properties (table 11) 318
Depth. USDA texture. Classification—Unified, AASHTO. Fragments greater than 3 inches. Percentage passing sieve number—4, 10, 40, 200. Liquid limit. Plasticity index.

Physical and chemical properties of the soils (table 12) 337
Depth. Clay. Permeability. Available water capacity. Soil reaction. Salinity. Shrink-swell potential. Erosion factors. Wind erodibility group. Organic matter.

Soil and water features (table 13) 350
Hydrologic group. Flooding. High water table. Bedrock. Potential frost action. Risk of corrosion.

Classification of the soils (table 14)..... 361
Family or higher taxonomic class.

Foreword

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

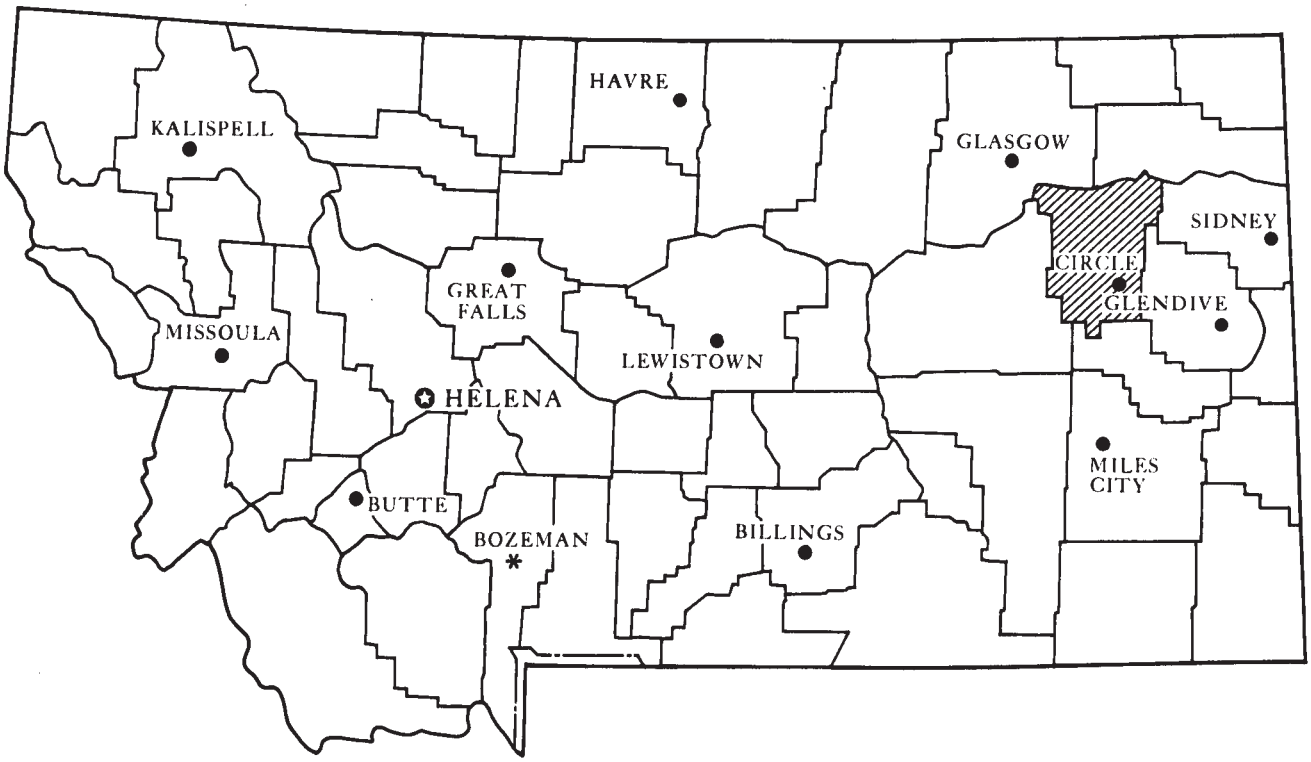
This soil survey is designed for many different users. Farmers, ranchers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use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

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

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Soil Conservation Service or the Cooperative Extension Service.

Glen H. Loomis

Glen H. Loomis
State Conservationist
Bozeman, Montana



* State Agricultural Experiment Station

Soil Survey of
McCone County, Montana

By Donald E. Strom

Fieldwork by Donald E. Strom, Kenneth Drecksel, Edward Brincken, and Kenneth Lucklow, Soil Conservation Service

United States Department of Agriculture, Soil Conservation Service, in cooperation with the United States Department of the Interior, Bureau of Land Management and Fish and Wildlife Service, and the Montana Agricultural Experiment Station

McCONE COUNTY is in the east-central part of Montana. The southern and eastern parts of the county are characterized by gently rolling to strongly rolling hills and terraces, and the western part is characterized by moderately sloping terraces and benches and by rough badland. The county has a total area of about 1,660,160 acres, or 2,594 square miles. About 493,585 acres is used as cropland, 56,003 acres as pastureland, 839,223 acres as rangeland, 4,453 acres as forest land, and 1,943 acres as sites for farmsteads, roads, and feedlots. The remaining 264,953 acres is federal land, urban and built-up areas, and small areas of water.

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

General Nature of the Survey Area

This section gives general information concerning the settlement and development, ground water resources, mineral resources, and climate of the survey area.

Settlement and Development

By O. M. Mabry, soil conservationist, Soil Conservation Service.

McCone County was organized on February 12, 1919, and was named in honor of State Senator George McCone.

McCone County is prairie country. Circle, the county seat and largest town, has a population of 960. Vida and Brockway are the other commercial centers.

Fur trappers and buffalo hunters came to this area about 1880. In 1882 Texas longhorns were brought to the area. The first cattle operations had as many as 100,000 head of cattle.

The Northern Pacific Railroad came into the county about 1884. Cattle were shipped by rail from the south and then trailed on to the north.

The Homestead Law of 1862 gave the settlers the right to claim the land they occupied. Thousands of people filed claim on homesteads. Nonirrigated farming became important after 1900. The peak of this movement was reached about 1910. During the droughts in 1917 to 1923 and in 1935 and 1936, many of the homesteaders were forced to move out. Many went to work building Fort Peck Dam. The land was left barren. After 1935, much of the land was restored to grass and farming methods were improved. After the droughts were over, high protein wheat and good barley were produced in the county.

At the present time, there are 510 farms and ranches in the county. The main crops are wheat, oats, barley, and alfalfa hay.

Ground Water Resources

By Eddie Juvan, geologist, Soil Conservation Service.

Most of the water for domestic and livestock use in McCone County is obtained from wells. The wells range from shallow dug wells near the creeks to deep drilled wells in upland areas. They range from 15 feet to more than 900 feet in depth. The towns of Circle, Brockway, and Vida obtain their entire water supply from wells. The Missouri River offers an abundant supply of water for irrigation. This water is not used extensively for domestic purposes because of the large amount of sediment and mineral matter in suspension.

Ground water in the county is present in a variety of aquifers that have been classified as alluvial deposits of sand and gravel, glacial deposits, high terrace deposits of sand and gravel, and formations of sandstone, siltstone, coal, fissill sandy shale, and baked clinker beds (*6*).

Of great significance to the ground water supply of McCone County are the alluvial and low terrace deposits in the river valleys and in the inner valleys of most streams. The alluvial and terrace deposits are the most permeable water-bearing formations in the county. Yields from these aquifers range from 15 to 1,000 gallons per minute.

Consolidated bedrock of significance to ground water supply underlies a large part of the county. Wells penetrating the permeable bedrock provide water for several towns and for some industries, as well as a large percentage of that used for domestic purposes and by livestock. There are many rock formations that are water-bearing, but not all of the formations are present in any given area. The drilling depth required to penetrate a given formation varies with location and elevation.

Water quality tends to vary greatly because of differences in the chemical characteristics and the content of dissolved solids. These variations depend mainly on geology and the precipitation in an area. The permeability and recharge characteristics of the rock in most of McCone County allow ground water to move slowly and pick up dissolved minerals. In areas where shale zones are hydraulically connected to producing aquifers, the water is more highly mineralized. Mineral content of the water generally increases with depth.

The most important bedrock aquifers in McCone County include the Fox Hills Sandstone, Hell Creek Sandstone, and the Tongue River Sandstone and coalbeds. In the northern part of the county, a few wells have penetrated the Judith River Sandstone. This zone is under artesian head, and surface flow of water has been established at low elevations. These artesian wells are primarily along the flood plain of the Missouri River.

Mineral Resources

By Eddie Juvan, geologist, Soil Conservation Service.

Rock and mineral resources can be divided into three groups: (1) metals; (2) fuels, consisting of coal, oil, and gas; and (3) nonmetallic or industrial minerals. McCone County has no metal resources, but it has some potential for the production of natural gas and oil and has a large quantity of valuable coal deposits. Nonmetallic or industrial minerals, with the exception of sand and gravel, have not been mined extensively in McCone County; however, bentonite deposits do occur in Cretaceous shale in the northern and western parts of the county.

Although McCone County is not one of Montana's leading oil- and gas-producing counties, producing wells have been developed (*5*). Extensive exploration for natural gas and oil is being conducted to the east in Richland County. As the search for oil and gas intensifies, many exploratory wells will undoubtedly be drilled in McCone County.

Minable coal resources in McCone County are many. Coal occurs in the Fox Hills and Hell Creek Members of the Lance Formation. These coal deposits are in small isolated areas and are not considered to have high potential for economic exploitation. The Lebo Shale Member of the Fort Union Formation contains several lenses of coal; however, the only deposit that can be traced is the Big Dirty Bed, which reaches a thickness of 20 feet. This bed contains many impurities and varies greatly in quality from place to place. The Big Muddy Coalbed is mined locally in McCone County.

The most promising coalbeds in McCone County are in the Tongue River Member of the Fort Union Formation. There are a number of beds that are variable in thickness but are uniformly of good quality. Many of these beds are near the surface and would be suitable for strip mining.

Nonmetallic or industrial minerals are important resources in McCone County. Sand and gravel deposits of fluvial, glacial, or residual origin are mined extensively. These materials are used in concrete and asphalt, in highway and other road construction, and as ballast on railroads.

Bentonite deposits are in the northwestern part of McCone County; however, extensive mining operations have not been developed. It is mined in areas north and west of the county. If use of this material is intensified, mining could be initiated in McCone County.

Climate

By the National Climatic Center, Asheville, North Carolina.

McCone County generally is quite warm in summer and is characterized by frequent hot days and occasional cool days. It is very cold in winter as a result of the arctic air that frequently surges over the county. Most precipitation falls during the warm period and is normally heaviest late in spring and early in summer. Winter snowfall normally is moderate, and it is blown into drifts so that much of the ground is free of snow.

Table 1 gives data on temperature and precipitation for the survey area, as recorded at Brockway, Circle, Vida, and Fort Peck, Montana, for the period 1951 to 1978. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter the average temperatures at Brockway, Circle, Vida, and Fort Peck are 17, 16, 17, and 17 degrees F, respectively. The average daily minimum temperature is 5 degrees at Brockway and Circle and is 7 degrees at Vida and Fort Peck. The lowest temperature recorded, -47 degrees, occurred at

Brockway on February 28, 1962. In summer the average temperature is 66 to 68 degrees at Brockway, Circle, and Vida and is 69 degrees at Fort Peck. The average daily maximum temperature is about 83 degrees. The highest recorded temperature, which occurred at Vida on July 19, 1960, is 109 degrees.

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

The total annual precipitation is 12 to 13 inches at Brockway and Fort Peck, 15 inches at Circle, and 16 inches at Vida. Of this, 80 percent usually falls in April through September, which includes the growing season for most crops. The heaviest 1-day rainfall during the period of record was 3.99 inches at Fort Peck on June 18, 1964. Thunderstorms occur on about 27 days each year, and most occur in summer.

Average seasonal snowfall is 12 inches at Brockway, 36 inches at Circle, 14 inches at Fort Peck, and 47 inches at Vida. The greatest snow depth at any one time during the period of record was 33 inches. On the average, 4 days at Brockway and Fort Peck, 81 days at Circle, and 50 days at Vida have at least 1 inch of snow on the ground. The number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 50 percent. Humidity is higher at night, and the average at dawn is about 75 percent. The sun shines 80 percent of the time possible in summer and 45 percent in winter. The prevailing wind is from the west. Average windspeed is highest, 12 miles per hour, in spring.

Several times each winter storms with snow and high winds bring blizzard conditions to the area. Hail occurs during summer thunderstorms in small, scattered areas.

How this Survey was Made

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

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

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

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

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

General Soil Map Units

The general soil map at the back of this publication shows broad areas that have a distinctive pattern of soils, relief, and drainage. Each map unit on the general soil map is a unique natural landscape. Typically, a map unit consists of 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 can be used to compare the suitability of large areas for general land uses. Areas of suitable soils can be identified on the map. Likewise, areas where the soils are not suitable can be identified.

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

The 22 general map units in this survey area have been grouped into five general kinds of landscape for broad interpretative purposes. Each of the broad groups and the map units in each group are described in the following pages.

Dominantly nearly level alluvial soils that are deep and well drained; on terraces and flood plains

This group consists of three map units. It makes up about 9.5 percent of the county. Elevation is 1,900 to 2,600 feet. The average annual precipitation is about 10 to 16 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is 90 to 125 days.

The soils in this group are deep and well drained. They formed in alluvium along the Missouri River, Redwater River, Prairie Elk Creek, Timber Creek, and their tributaries.

This group is used mainly for irrigated and nonirrigated crops. It is also used as rangeland.

1. Cherry-Havrelon-Trembles

Loamy, moist soils that are nearly level and gently sloping and are subject to flooding

This map unit is on smooth terraces and flood plains along the Redwater River and its tributaries. The unit is subject to rare or occasional periods of flooding. Slope is 0 to 4 percent.

This unit makes up about 3.5 percent of the county. It is about 40 percent Cherry and similar soils, 20 percent Havrelon soils, and 15 percent Trembles soils. The remaining 25 percent is soils of minor extent.

Cherry soils are on higher terraces. The surface layer is light brownish gray silt loam. The subsoil is mostly pale yellow and light brownish gray silt loam. The substratum is mostly light brownish gray silt loam.

Havrelon soils are on low terraces and flood plains. The surface layer is pale brown loam, and the underlying material is pale brown very fine sandy loam.

Trembles soils are on terraces and flood plains. The surface layer is grayish brown fine sandy loam, and the underlying material is yellowish brown and light brownish gray fine sandy loam.

Of minor extent in this unit are poorly drained Typic Fluvaquents and Typic Fluvaquents, saline, in stream channels and on flood plains; Alona soils on terraces; and Banks soils on flood plains and low terraces. Also included are soils on short, steep slopes along terrace edges.

Most areas of this unit are used for nonirrigated and irrigated farming. Wheat, oats, barley, and alfalfa hay are the primary crops. The unit is used as rangeland in areas where it is dissected by stream channels and farming is not practical.

The hazard of soil blowing is the major limitation of this unit for cultivated crops. A good ground cover of straw mulch or stubble helps to control soil blowing. This unit responds well to proper grazing use and planned grazing systems. If overgrazed, it can be treated by mechanical methods, such as chiseling, or reseeded with adapted plants.

This unit is poorly suited to homesite development because of the hazard of flooding.

2. Harlem-Havre-Glendive

Clayey and loamy, dry soils that are nearly level and are protected from flooding

This map unit is on smooth terraces and the flood plain of the Missouri River, along the northern edge of the county. Most of this unit is protected from flooding by the Fort Peck Dam. Slope is 0 to 2 percent.

This map unit makes up about 3.5 percent of the county. It is about 50 percent Harlem and similar soils,

25 percent Havre soils, and 15 percent Glendive soils. The remaining 10 percent is soils of minor extent.

Harlem soils are on terraces and in old oxbows on flood plains. The surface layer is grayish brown silty clay, and the underlying material is light brownish gray and grayish brown silty clay.

Havre soils are on terraces. The surface layer is light brownish gray silt loam, and the underlying material is light brownish gray silt loam with thin lenses of fine sandy loam.

Glendive soils are on terraces. The surface layer is grayish brown loam, and the underlying material is grayish brown fine sandy loam with thin lenses of loamy fine sand.

Of minor extent in this unit are very poorly drained Dimmick soils in basins and on lake beds; Pendroy soils on terraces; Harlem, Havre, and Glendive soils that are flooded and are on low terraces and the edges of the flood plain; and soils in the eastern parts of the unit that receive more rainfall.

About 85 percent of the unit has been cleared of cottonwood trees. Most of the cleared areas are used for nonirrigated and irrigated farming. The remaining areas are grazed. Wheat, oats, barley, and alfalfa hay are the main crops grown.

The hazard of soil blowing is the major limitation of this unit for use as cropland.

3. Lonna-Havre-Glendive

Loamy, dry soils that are nearly level and are subject to flooding

This map unit is on smooth terraces and flood plains along Timber and Prairie Elk Creeks. The Havre and Glendive soils are subject to rare or occasional periods of flooding. Slope is 0 to 2 percent.

This unit makes up about 2.5 percent of the county. It is about 30 percent Lonna and similar soils, 25 percent Havre soils, and 20 percent Glendive soils. The remaining 25 percent is soils of minor extent.

The Lonna soils are generally on the higher terraces. The surface layer is brown silty clay loam. The subsoil is very pale brown silty clay loam and silt loam.

The Havre soils are generally on low terraces and flood plains. The surface layer is light brownish gray silt loam, and the underlying material is light brownish gray silt loam with thin lenses of fine sandy loam.

The Glendive soils are generally on low terraces and flood plains. The surface layer is grayish brown loam, and the underlying material is grayish brown fine sandy loam with thin lenses of loamy fine sand.

Of minor extent in this unit are the Alona soils on terraces and fans; poorly drained Typic Fluvaquents, saline, in stream channels; and excessively drained Hanly soils on terraces and flood plains. Also included are soils on short, steep slopes along terrace edges.

Most areas of this unit are used for nonirrigated crops. Some areas are irrigated by diversions and border dikes. Wheat, oats, barley, and alfalfa hay are the primary crops. The unit is used as rangeland in areas where it is dissected by stream channels and farming is not practical.

The hazard of soil blowing is the main limitation of this unit for cultivated crops. A good ground cover of straw mulch or stubble helps to control soil blowing. If overgrazed, the unit can be treated by mechanical methods, such as chiseling, or reseeded with adapted plants.

This unit is poorly suited to homesite development because of the hazard of flooding.

Dominantly undulating to hilly soils that are deep and well drained; on glaciated plains

This group consists of four map units. It makes up about 16 percent of the county. Elevation is 1,900 to 2,600 feet. The average annual precipitation is about 12 to 16 inches, the average annual air temperature is 43 degrees F, and the average frost-free season is 90 to 125 days.

The soils in this group are deep and well drained. They formed in glacial till and alluvium.

This group is used mainly for nonirrigated farming. It is also used as rangeland.

4. Williams-Zahill

Loamy, moist soils that are nearly level to strongly rolling and formed in glacial till

This map unit is on rolling uplands and low hills in the northeastern part of the county. Slope is 0 to 15 percent.

This map unit makes up about 8 percent of the county. It is about 50 percent Williams and similar soils and 35 percent Zahill soils. The remaining 15 percent is soils of minor extent.

Williams soils generally are on side slopes and in swales. The surface layer is dark grayish brown loam. The subsoil is dark grayish brown and brown clay loam. The substratum is light gray and light olive gray clay loam.

Zahill soils generally are on upper side slopes and ridges of hills. The surface layer is brown loam, and the underlying material is mostly light brownish gray clay loam.

Of minor extent in this unit are moderately sodium-affected Thoeny soils on fans and foot slopes; strongly sodium- and salt-affected Adger soils on fans; and Shambo and Farnuf soils on fans and foot slopes.

Most areas of this unit are used for nonirrigated farming. Small areas on uplands and creek bottoms are used as rangeland and pastureland. Because the unit receives an average of 15 inches of precipitation per year, it produces good crop yields.

5. Zahill-Vida

Loamy, moist soils that are undulating to hilly and formed in glacial till

This map unit is on hills and ridges and in swales and valleys in the northeastern part of the county. The ridges are generally aligned in an east-west orientation, separating the major creeks. Slope is 2 to 25 percent.

This unit makes up about 5.5 percent of the county. It is about 45 percent Zahill and similar soils and 30 percent Vida soils. The remaining 25 percent is soils of minor extent.

Zahill soils generally are on side slopes and ridges of hills. The surface layer is brown loam, and the underlying material is mostly light brownish gray clay loam.

Vida soils generally are on the lower side slopes and in swales. The surface layer is brown clay loam. The subsoil is mostly light brownish gray loam. The substratum is light gray clay loam.

Of minor extent in this unit are shallow, well drained Cabba soils on ridges of hills; moderately salt-affected and strongly sodium-affected Alona soils on terraces of creeks; and Bryant and Shambo soils on fans and terraces.

About half of this unit is used for nonirrigated crops, and the rest is used as rangeland. Nonirrigated farming is concentrated in the less hilly areas and on upland benches. The hazard of soil blowing and the potential for saline seeps are the main limitations of the unit for use as cropland.

6. Telstad-Hillon

Loamy, dry soils that are undulating to strongly rolling and formed in glacial till

This map unit is on undulating uplands and hills, in swales, and on low ridges in the northwestern part of the county. Slope is 2 to 15 percent.

This unit makes up about 1.5 percent of the county. It is about 40 percent Telstad and similar soils and 40 percent Hillon soils. The remaining 20 percent is soils of minor extent.

Telstad soils generally are on the lower side slopes and in swales. The surface layer is dark grayish brown loam. The subsoil is grayish brown clay loam and light gray loam. The substratum is light brownish gray loam.

Hillon soils generally are on hills and the upper side slopes. The surface layer is grayish brown loam, and the underlying material is mostly light gray loam.

Of minor extent in this unit are the moderately sodium-affected Thoeny soils in sparsely vegetated, shallow, depressional areas on fans of uplands and Evanston soils on fans and terraces.

About 50 percent of this unit is used for nonirrigated farming. The rest is used as rangeland. Farming is concentrated on the undulating uplands and low hills. The hazard of soil blowing is the main limitation of the unit for use as cropland.

7. Gerdrum-Hillon

Loamy, dry soils that are nearly level to hilly and formed in salt- and sodium-affected alluvium and in glacial till

This map unit is on smooth fans, side slopes, and hills of glaciated uplands, mostly in the west-central part of the county. The side slopes and fans generally are long and smooth. The fans and side slopes are characterized by small, sparsely vegetated, shallow, depressional areas. Slope is 0 to 25 percent.

This unit makes up about 1 percent of the county. It is about 40 percent Gerdrum and similar soils and about 40 percent Hillon soils. The remaining 20 percent is soils of minor extent.

Gerdrum soils generally are on fans and foot slopes of hills. They formed in salt- and sodium-affected alluvium. The surface layer is light brownish gray clay loam. The subsoil is mainly light brownish gray clay and clay loam. The substratum is light brownish gray clay loam.

Hillon soils generally are on the upper side slopes and ridges of hills. They formed in glacial till. The surface layer is grayish brown loam, and the underlying material is mostly light gray loam.

Of minor extent in this unit are moderately sodium-affected Thoeny soils on fans; Typic Fluvaquents, saline, on creek bottoms; and Boxwell soils on terraces.

This unit is used mainly as rangeland. Some small areas of the minor soils are used for nonirrigated farming. This unit responds well to planned grazing systems and some mechanical methods of range improvement.

Dominantly strongly rolling to steep soils that are shallow to deep and well drained and somewhat excessively drained; on glaciated plains

This group consists of five map units. It makes up about 16.5 percent of the county. Elevation is about 2,000 to 2,600 feet. The average annual precipitation is about 12 to 16 inches, the average annual air temperature is 43 degrees F, and the frost-free season is 90 to 125 days.

The soils in this group are shallow to deep and are well drained and somewhat excessively drained. They formed in glacial till, weakly consolidated sedimentary beds, and alluvium.

This group is used mainly as rangeland. A few areas on the lower side slopes are used for nonirrigated farming. Areas of Badland are used for wildlife habitat, watershed, and recreation.

8. Zahill-Cabba

Loamy, moist soils that are deep and shallow, are strongly rolling to steep, and formed in glacial till and material derived from weakly consolidated, sandy and silty sedimentary beds

This map unit is in the northeastern part of the county. It is mainly on strongly rolling uplands that are dissected by deeply entrenched coulees. Some areas are on smooth benches of uplands and on terraces. Slope is 8 to 45 percent.

This unit makes up about 7 percent of the county. It is about 55 percent Zahill and similar soils and 30 percent Cabba soils. The remaining 15 percent is soils of minor extent.

Zahill soils are deep and generally are on side slopes and ridges of hills on uplands. The surface layer is brown loam, and the underlying material is pale brown and light brownish gray clay loam.

Cabba soils are shallow and generally are on ridges of hills and side slopes of coulees. The surface layer is light yellowish brown loam. The underlying material is light yellowish brown and pale yellow loam over weakly consolidated, sandy and silty sedimentary beds.

Of minor extent in this unit are moderately sodium-affected and strongly salt-affected Alona soils on terraces, Dast soils on ridges of some hills, and Vida soils in the smoother upland areas.

Most of this unit is used as rangeland. The smoother areas and some areas of the minor soils are used for nonirrigated farming. This unit responds well to planned grazing systems and proper grazing use. The less sloping areas are suitable for mechanical treatment and seeding to adapted plants.

9. Zahill-Badland

Loamy, moist soils that are deep, are hilly to very steep, and formed in glacial till, and Badland

This map unit is in the northeastern part of the county. It is on high, narrow hills and ridges, in areas dissected and eroded by streams, and on small rolling upland benches between coulees. Slope is 15 to 45 percent.

This unit makes up about 1 percent of the county. It is about 45 percent Zahill and similar soils and about 30 percent Badland. The remaining 25 percent is soils of minor extent.

Zahill soils generally are on the vegetated side slopes of coulees and the upper side slopes of hills and ridges. The surface layer is brown loam, and the underlying material is pale brown and light brownish gray clay loam.

Badland generally is in steep and very steep coulees and on narrow ridges and buttes. It consists mainly of eroded and exposed, weakly consolidated, silty and sandy sedimentary beds and semiconsolidated shale.

Of minor extent in this unit are Vida and Williams soils on upland benches, moderately sodium-affected and strongly salt-affected Gerdrum soils on fans below areas of Badland, and Cabba soils on ridges of some hills.

Nearly all of this unit is used as rangeland. Some small areas of the minor soils on upland benches are used for nonirrigated farming. This unit responds well to planned grazing systems and proper grazing use. It is poorly suited to mechanical treatment for range improvement because of steepness of slope and the areas of Badland.

10. Sunburst-Fleak-Busby

Loamy and sandy, dry soils that are deep and shallow, are hilly and steep, and formed in glacial till, in material derived from weakly consolidated sandy sedimentary beds, and in alluvium

This map unit is in the northwestern part of the county. It is on high hills and in deeply entrenched areas. Slope is 15 to 45 percent.

This unit makes up about 4.5 percent of the county. It is about 30 percent Sunburst and similar soils, 25 percent Fleak soils, and 25 percent Busby soils. The remaining 20 percent is soils of minor extent.

Sunburst soils are deep and generally are on ridges and upper side slopes of hills capped with glacial till. They formed in glacial till. The surface layer is grayish brown clay loam, and the underlying material is mostly grayish brown silty clay.

Fleak soils are shallow and generally are on ridges and upper side slopes of hills. They formed in weakly consolidated sedimentary beds. The surface layer is olive brown loamy sand. The underlying material is olive loamy sand over weakly consolidated, sandy sedimentary beds.

Busby soils are deep and generally are on lower side slopes and in swales. They formed in alluvium. The surface layer is grayish brown fine sandy loam. The subsoil is light olive brown fine sandy loam. The substratum is mostly light brownish gray fine sandy loam.

Of minor extent in this unit are shallow Neldore soils on shale hills and ridges; Yamac soils on lower side slopes; moderately sodium-affected and strongly salt-affected Gerdrum soils on some fans below shale outcroppings; and Kremlin soils on fans, terraces, and smooth side slopes of uplands.

This unit is used as rangeland. It responds well to planned grazing systems and proper grazing use. It is very poorly suited to mechanical range improvement.

11. Hillon

Loamy, dry soils that are deep, are strongly rolling to steep, and formed in glacial till

This map unit is in the northwestern part of the county. It is on high hills and ridges and in deeply entrenched areas. The unit is drained by many small creeks that have actively eroded, deep coulees and channels in the glacial till mantle. Slope is 8 to 45 percent.

This unit makes up about 2 percent of the county. It is about 75 percent Hillon and similar soils. The remaining 25 percent is soils of minor extent.

Hillon soils generally are on the sides and tops of hills and ridges. The surface layer is grayish brown loam, and the underlying material is mostly light gray loam.

Of minor extent in this unit are shallow Fleak soils in areas where the glacial till cap has been eroded, moderately sodium-affected Gerdrum and Rominell soils on fans below areas of Badland, and Telstad soils on smooth upland benches. Also included are small areas of Badland.

This unit is used as rangeland. It responds well to planned grazing systems and proper grazing use. It is poorly suited to treatment by mechanical range improvement methods because of steepness of slope.

12. Hillon-Badland

Loamy, dry soils that are deep, are hilly and steep, and formed in glacial till, and Badland

This map unit is in the north-central part of the county. It is on high, narrow hills and ridges and in areas that are dissected and eroded by streams. Slope is 15 to 45 percent.

This unit makes up about 2 percent of the county. It is about 40 percent Hillon and similar soils and about 30 percent Badland. The remaining 30 percent is soils of minor extent.

Hillon soils generally are on side slopes and ridges of hills. The surface layer is grayish brown loam, and the underlying material is mostly light gray loam.

Badland generally is in steep and very steep coulees and on narrow ridges and buttes. It consists mainly of eroded and exposed, weakly consolidated, silty and sandy sedimentary beds and consolidated shale.

Of minor extent in this unit are Telstad soils on upland benches, moderately sodium-affected and strongly salt-affected Gerdrum soils on fans below areas of Badland, and Kremlin soils on fans and terraces.

This unit is used mainly as rangeland. It responds well to planned grazing systems and proper grazing use. The unit is very poorly suited to mechanical methods of range improvement because of the slope and areas of Badland.

Dominantly gently sloping to moderately steep soils that are shallow to deep and are well drained; on sedimentary uplands

This group consists of five map units. It makes up about 38 percent of the county. Elevation is 1,900 to 3,400 feet. The average annual precipitation is about 12 to 14 inches, the average annual air temperature is 43 degrees F, and the average frost-free season is 90 to 125 days.

The soils in this group are shallow to deep and are well drained. They formed in alluvium and material derived from weakly consolidated, sandy and silty sedimentary beds.

This group is used mainly for nonirrigated farming. It is also used as rangeland.

13. Cambert-Bryant

Loamy, moist soils that are moderately deep and deep, are nearly level to strongly sloping, and formed in alluvium and in material derived from weakly consolidated, silty sedimentary beds

This map unit is in the southeastern part of the county. It is on long, smooth fans and terraces and low hills and ridges. The streams that drain this unit have pronounced channels and flood plains that are defined by sharp terrace edges. Slope is 0 to 15 percent.

This unit makes up about 19 percent of the county. It is about 55 percent Cambert and similar soils and 20 percent Bryant soils. The remaining 25 percent is soils of minor extent.

Cambert soils are moderately deep and generally are on side slopes and tops of hills and ridges. They formed in weakly consolidated, silty sedimentary beds. The surface layer is brown loam. They formed in weakly consolidated, silty sedimentary beds. The subsoil is mostly brown loam. The substratum is very pale brown silty clay loam. Below this are weakly consolidated, silty sedimentary beds.

Bryant soils are deep and generally are on fans and terraces and in swales. They formed in alluvium. The surface layer is dark grayish brown silt loam. The subsoil is dark grayish brown and grayish brown silt loam and light brownish gray silty clay loam. The substratum is mostly light gray silty clay loam.

Of minor extent in this unit are Cabba and Dast soils on ridges of hills, moderately sodium-affected and strongly salt-affected Alona soils on some terraces, and Lisk soils in swales and on lower side slopes of hills.

About 60 percent of this unit is used for nonirrigated farming. The remaining 40 percent is used as rangeland. There are no major limitations of the unit for use as cropland, but the hazards of soil blowing and water erosion can be severe in large areas of barren fallowed land. This unit is suitable for mechanical rangeland improvement practices and for planting adapted grasses.

14. Cabba-Cambert

Loamy, moist soils that are shallow and moderately deep, are gently sloping to moderately steep, and formed in material derived from weakly consolidated, sandy and silty sedimentary beds

This map unit is in the southeastern part of the county. It is on short to medium side slopes of fans and on hills and ridges on uplands. The hills and ridges have moderately steep side slopes and rounded tops. The hills separate small drainageways in the unit. Slope is 2 to 25 percent.

This unit makes up about 5.5 percent of the county. It is about 40 percent Cabba and similar soils and 30 percent Cambert soils. The remaining 30 percent is soils of minor extent.

Cabba soils are shallow and generally are on the tops and upper side slopes of hills and ridges. The surface layer is light yellowish brown loam. The underlying material is light yellowish brown and pale yellow loam over weakly consolidated, sandy and silty sedimentary beds.

Cambert soils are moderately deep and generally are on the lower side slopes of hills and in swales. The surface layer is brown loam. The subsoil is mostly brown loam. The substratum is very pale brown silty clay loam. Below this is weakly consolidated, silty sedimentary beds.

Of minor extent in this unit are Bryant and Shambo soils in swales and on fans, Dast soils on ridges, and gravelly Wabek soils on the tops of some hills.

About 60 percent of this unit is used as rangeland, and 40 percent is used for nonirrigated farming. The hazards of soil blowing and water erosion are the main limitations of this unit for use as cropland. This unit responds well to planned grazing systems and proper grazing use. It is suitable for treatment by mechanical rangeland improvement practices and for seeding to adapted grasses.

15. Cabbart-Busby

Loamy, dry soils that are shallow and deep, are moderately sloping to moderately steep, and formed in material derived from weakly consolidated, sandy and silty sedimentary beds and in alluvium

This map unit is mainly on fans, hills, and ridges on uplands in the west-central part of the survey area. The unit is dissected by coulees and drainageways. Slope is 4 to 25 percent.

This unit makes up about 8 percent of the county. It is about 50 percent Cabbart and similar soils and 30 percent Busby soils. The remaining 20 percent is soils of minor extent.

Cabbart soils are shallow and generally are on side slopes and tops of hills and ridges on uplands. They formed in weakly consolidated, sandy and silty sedimentary beds. The surface layer is grayish brown silt loam. The underlying material is pale olive silt loam over weakly consolidated, sandy and silty sedimentary beds.

Busby soils are deep and generally are on fans and side slopes of hills and in swales. They formed in alluvium. The surface layer is grayish brown fine sandy loam. The subsoil is light olive brown fine sandy loam. The substratum is mostly light brownish gray fine sandy loam.

Of minor extent in this unit are Yamac, Kremlin, and Chinook soils in swales and on fans and Fleak soils on ridges of hills.

About 75 percent of this unit is used as rangeland, and the remaining 25 percent is used for nonirrigated farming. The main limitations of the unit for use as cropland are steepness of slope and the high hazard of soil blowing. The unit responds well to proper grazing use and planned grazing systems. It is suitable for treatment by mechanical rangeland improvement practices and for seeding to adapted grasses.

16. Cambeth-Floweree

Loamy, dry soils that are moderately deep and deep, are gently sloping to strongly sloping, formed in local alluvium and in material derived from weakly consolidated, silty sedimentary beds

This map unit is in the southwestern part of the county. It is on smooth fans and terraces and on hills and ridges on uplands. The unit is drained by small tributaries of Timber Creek. Slope is 2 to 15 percent.

This unit makes up about 4.5 percent of the county. It is about 40 percent Cambeth and similar soils and 30 percent Floweree soils. The remaining 30 percent is soils of minor extent.

Cambeth soils are moderately deep and generally are on the upper side slopes and ridges of hills on uplands. They formed in weakly developed, silty sedimentary beds. The surface layer is brown silt loam. The subsoil is mostly light yellowish brown silt loam. The substratum is pale yellow silt loam. Below this is white, weakly consolidated, silty sedimentary beds.

Floweree soils are deep and generally are on fans, terraces, and the lower side slopes of hills. They formed in alluvium. The surface layer is grayish brown silt loam. The subsoil is mostly light brownish gray silt loam. The substratum is light brownish gray silt loam and grayish brown silty clay loam.

Of minor extent in this unit are Cabbart and Fleak soils on ridges and tops of hills, Busby and Chinook soils in swales and on fans, and Typic Fluvaquents, saline, in creek channels.

About 60 percent of this unit is used as rangeland. The remaining 40 percent is used for nonirrigated farming. The hazards of soil blowing and water erosion are only minor limitations for use of the unit as cropland. This unit responds well to proper grazing use and planned grazing systems. It is also suited to mechanical methods of rangeland improvement and to seeding of adapted grasses.

17. Gerdrum-Busby-Yamac

Loamy, dry soils that are deep, are moderately sloping to moderately steep, and formed in alluvium

This map unit is in the west-central part of the county. It is on long, smooth fans and terraces, low hills, and narrow ridges and in deeply entrenched coulees. This unit is dissected by many small drainageways that flow into Rock Creek and Fort Peck Lake. Slope is 4 to 25 percent.

This unit makes up about 1 percent of the county. It is about 35 percent Gerdrum and similar soils, 20 percent Busby soils, and 20 percent Yamac soils. The remaining 25 percent is soils of minor extent.

Gerdrum soils generally are on fans and terraces below areas of exposed shale and Badland. The surface layer is light brownish gray clay loam. The subsoil is mainly light brownish gray clay and clay loam. The substratum is light brownish gray clay loam.

Busby soils generally are on fans and side slopes of hills and in swales. The surface layer is grayish brown fine sandy loam. The subsoil is light olive brown fine sandy loam. The substratum is mostly light brownish gray fine sandy loam.

Yamac soils generally are on fans and side slopes of hills and in swales. The surface layer is grayish brown loam. The subsoil is olive and grayish brown loam. The substratum is pale olive loam.

Of minor extent in this unit are Fleak and Yawdim soils on the tops of hills and ridges, Chinook and Evanston soils on fans, and areas of Badland.

This unit is used mainly as rangeland. Only small areas, generally areas of the minor soils, are used for nonirrigated farming. This unit responds well to planned grazing systems and proper grazing use. It is suited to mechanical rangeland improvement practices.

Dominantly strongly sloping to steep soils that are shallow to deep and well drained to excessively drained; on sedimentary uplands

This group consists of five map units. It makes up about 20 percent of the county. Elevation is 1,900 to 3,400 feet. The average annual precipitation is about 12 to 14 inches, the average annual air temperature is 43 degrees F, and the average frost-free season is 90 to 125 days.

The soils in this group are shallow to deep and well drained to excessively drained. They formed in material derived from weakly consolidated, silty and sandy sedimentary beds, consolidated shale, and alluvium.

This group is used mainly as rangeland. A few small areas on the lower side slopes are used as nonirrigated cropland. Areas of Badland are used for watershed, wildlife habitat, and recreation.

18. Cabba-Dast-Wabek

Loamy, moist soils that are shallow to deep, are strongly sloping to steep, and formed in material derived from weakly consolidated, silty and sandy sedimentary beds and in gravelly alluvium

This map unit is in the southeastern part of the county. It is on long, high hills and ridges that separate the creeks. Slope is 8 to 45 percent.

This unit makes up about 2 percent of the county. It is about 40 percent Cabba and similar soils, 25 percent Dast soils, and 15 percent Wabek soils. The remaining 20 percent is soils of minor extent.

Cabba soils are shallow and generally are on side slopes and ridges of hills. The surface layer is light yellowish brown loam. The underlying material is light yellowish brown and pale yellow loam over weakly consolidated, sandy and silty sedimentary beds.

Dast soils are moderately deep and generally are on the upper side slopes of hills and ridges. The surface layer is brown fine sandy loam. The underlying material is light gray and very pale brown fine sandy loam over pale yellow, weakly consolidated, sandy sedimentary beds.

Wabek soils are deep and generally are on the tops of hills and ridges and on benches. The surface layer is grayish brown sandy loam, and the underlying material is light gray very gravelly sand.

Of minor extent in this unit are Shambo and Macar soils on fans and in swales and Cambert soils on lower side slopes.

Nearly all this unit is used as rangeland. Some small areas on benches are used for nonirrigated farming. This unit responds well to planned grazing systems are proper grazing use. It is poorly suited to mechanical methods of rangeland improvement because of steepness of slope.

19. Cabba-Badland

Loamy, moist soils that are shallow, are moderately steep to steep, and formed in material derived from weakly consolidated, sandy and silty sedimentary beds, and Badland

This map unit is in the southeastern part of the county. It is on high hills and ridges, in deeply entrenched coulees, and on isolated buttes. Slope is 8 to 45 percent.

This unit makes up about 1 percent of the county. It is about 40 percent Cabba and similar soils and 35 percent Badland. The remaining 25 percent is soils of minor extent.

Cabba soils generally are on isolated buttes and upper side slopes and tops of hills and ridges. The surface layer is light yellowish brown loam. The underlying material is light yellowish brown and pale yellow loam over weakly consolidated, sandy and silty sedimentary beds.

Badland generally is in steep and very steep coulees and on narrow ridges and buttes. It consists mainly of eroded and exposed, weakly consolidated, sandy and silty sedimentary beds and semiconsolidated shale.

Of minor extent in this unit are Dast soils on hilltops, Shambo soils on fans, and Cambert soils on some of the larger benches and hilltops.

This unit is suited to use as rangeland, as watershed, and for recreation. It responds well to planned grazing systems and proper grazing use. It is very poorly suited to mechanical rangeland improvement practices because of the steepness of slope and the areas of Badland.

20. Badland-Gerdrum-Cabbart

Badland, and loamy, dry soils that are deep and shallow,

are strongly sloping to steep, and formed in salt- and sodium-affected alluvium and in material derived from weakly consolidated, sandy and silty sedimentary beds

This map unit is in deeply entrenched coulees, on isolated buttes and ridges, on long, smooth fans, and on uplands. It is mainly in the western part of the county. Slope is 8 to 45 percent.

This unit makes up about 9.5 percent of the county. It is about 35 percent Badland, 20 percent Gerdrum and similar soils, and 20 percent Cabbart soils. The remaining 25 percent is soils of minor extent.

Badland generally is in steep coulees and on narrow ridges and buttes. It consists mainly of eroded and exposed, weakly consolidated sedimentary beds of siltstone, shale, and sandstone.

Gerdrum soils are deep and generally are on fans and terraces below areas of Badland. The surface layer is light brownish gray clay loam. The subsoil is mainly light brownish gray clay and clay loam. The substratum is mostly light brownish gray clay loam.

Cabbart soils are shallow and generally are on the tops of some hills and in smooth or strongly sloping areas of uplands. The surface layer is grayish brown silt loam. The underlying material is pale olive silt loam over weakly consolidated, sandy and silty sedimentary beds.

Of minor extent in this unit are shallow Fleak and Yawdim soils on the upper side slopes and ridges of hills, Yamac and Kremlin soils on fans below areas of Fleak soils, and Sunburst soils on the tops of hills in the northern part of the unit.

This unit is used primarily as rangeland. It is not suited to cultivated crops because of the areas of Badland, the moderately sodium-affected and strongly salt-affected Gerdrum soils, and slope. Small areas of the minor soils on fans and terraces are used as cropland. This unit responds well to proper grazing use and planned grazing systems. Less sloping areas are suitable for mechanical range improvement practices.

21. Cabbart-Busby-Badland

Loamy, dry soils that are shallow and deep, are moderately steep and steep, and formed in material derived from weakly consolidated, sandy and silty sedimentary beds and in alluvium, and Badland

This map unit is on high hills and ridges and short fans and in deeply entrenched coulees. It is in the west-central part of the county. Slope is 15 to 45 percent.

This unit makes up about 5 percent of the county. It is about 30 percent Cabbart and similar soils, 25 percent Busby soils, and 20 percent Badland. The remaining 25 percent is soils of minor extent.

Cabbart soils are shallow and generally are on the tops and upper side slopes of hills and ridges. The surface layer is grayish brown silt loam. The underlying material is pale olive silt loam over weakly consolidated, sandy and silty sedimentary beds.

Busby soils are deep and generally are on fans and side slopes of hills and in swales. The surface layer is grayish brown fine sandy loam. The subsoil is light olive brown fine sandy loam. The substratum is pale brown and light brownish gray fine sandy loam.

Badland generally is in steep and very steep coulees and on narrow ridges and buttes. It consists mainly of eroded and exposed, soft sedimentary beds of siltstone, shale, and sandstone.

Of minor extent in this unit are shallow Yawdim soils on the upper side slopes and tops of hills and Gerdrum soils on fans below areas of Badland.

Nearly all this unit is used as rangeland. A few small areas, mainly of the minor soils, are used as cropland.

This unit responds well to planned grazing systems and proper grazing use. The less sloping areas are suitable for mechanical methods of rangeland improvement and for seeding to adapted species.

22. Neldore-Bascovy-Badland

Clayey, dry soils that are shallow and moderately deep, are moderately steep and steep, and formed in material derived from consolidated shale, and Badland

This map unit is on low to high, smooth hills and on the tops of hills and sides of coulees. It is in the northwestern part of the county. Slope is 15 to 45 percent.

This unit makes up about 2.5 percent of the county. It is about 35 percent Neldore and similar soils, 25 percent Bascovy and similar soils, and about 20 percent Badland. The remaining 20 percent is soils of minor extent.

Neldore soils are shallow and generally are on upper slopes and tops of hills. The surface layer is dark gray clay. The underlying material is dark grayish brown clay over olive gray consolidated shale.

Bascovy soils are moderately deep and generally are on side slopes of hills and ridges. The soils are grayish brown silty clay over olive gray consolidated shale.

Badland generally consists of exposed consolidated shale on the tops of hills, along coulee edges, and in eroded spots.

Of minor extent in this unit are Sunburst soils on the tops of some hills and Yamac soils on fans and terraces.

This unit is used primarily as rangeland. It is very poorly suited to cultivated crops because of the areas of Badland, shallow depth to consolidated shale, and steepness of slope. This unit responds well to planned grazing systems and proper grazing use. It is very poorly suited to mechanical rangeland improvement practices.

Detailed Soil Map Units

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

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

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

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

Soils of one series can differ in texture of the surface layer or of the underlying material. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Macar loam, 0 to 4 percent slopes, is one of several phases in the Macar series.

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

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

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

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

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

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

Detailed Map Unit Descriptions

1—Absher clay loam, 8 to 15 percent slopes. This deep, well drained, moderately salt-affected and strongly sodium-affected soil is on hillsides in the north-central and northeastern parts of the county. It formed in glacial till. Slopes are mainly less than 250 feet long. Elevation is 2,000 to 2,500 feet. The average annual precipitation is about 12 inches in the north-central part of the county and about 14 inches in the northeastern part. The average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Hillon, Thoeny, Yawdim, and Zahill soils and shale outcroppings. These areas do not adversely affect the use and management of this unit as rangeland.

Typically, this Absher soil, where mixed to a depth of 7 inches, has a surface layer of grayish brown clay loam. A thin, hard crust is on the surface. The subsoil is mostly light brownish gray clay loam and clay 20 inches thick. The substratum to a depth of 60 inches or more is mostly light brownish gray clay loam.

Permeability is very slow, and available water capacity is moderate. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 20 inches. Runoff

is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate. This soil is moderately salt-affected and strongly sodium-affected at a depth of about 5 inches.

This soil is used as rangeland.

Cropland.—This soil is poorly suited to cultivated crops because of the high content of salts and sodium in the subsoil. The salts and sodium reduce the availability of moisture and some nutrients and restrict the movement of roots and moisture into the subsoil. The percentage of seedling emergence is reduced by the hard crust that forms on the soil surface as the soil dries following heavy rainfall. These characteristics drastically limit crop yields.

Rangeland.—The potential native plant community is mainly western wheatgrass, green needlegrass, Montana wheatgrass, winterfat, and Nuttall saltbush. If the range is excessively grazed, the proportion of these plants decreases and the proportion of blue grama, Sandberg bluegrass, perennial forbs, and fringed sagewort increases. If excessive grazing continues, plants such as annuals, weedlike forbs, and clubmoss may invade. The potential native plant community produces about 800 pounds per acre of air-dry vegetation in years of above-normal precipitation and 400 pounds in years of below-normal precipitation.

Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Where clubmoss and blue grama are the dominant vegetation, practices such as scalping or shallow chiseling can be used to improve the rangeland. Such practices increase water infiltration, reduce plant competition, and allow the more desirable native plants to increase.

Windbreaks.—This soil is poorly suited to windbreaks. It is salt- and sodium-affected, which limits the choice of trees and shrubs to Russian-olive and silver buffaloberry.

Homesite development.—This soil is poorly suited to homesite development. It is limited mainly by very slow permeability, low soil strength, and shrink-swell potential. Buildings can be designed to offset the effects of shrinking and swelling. The soil is poorly suited to septic tank absorption fields because of very slow permeability. Shrinking and swelling and low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations.

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

2—Adger silty clay loam, 0 to 8 percent slopes. This deep, well drained, strongly salt- and sodium-affected soil is on fans, foot slopes, and terraces of glaciated uplands in the northeastern part of the county. It formed in alluvium. Slopes are mainly less than 1,000 feet long. Elevation is 2,000 to 2,500 feet. The average annual precipitation is about 15 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Absher, Thoeny, Vida, Shambo, and Yawdim soils. These areas do not adversely affect the use and management of this unit as rangeland.

Typically, this Adger soil, where mixed to a depth of 7 inches, has a surface layer of grayish brown silty clay loam. The subsoil is mostly light brownish gray silty clay loam 20 inches thick. The substratum to a depth of 60 inches or more is light brownish gray silt loam.

Permeability is slow, and available water capacity is moderate. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 20 inches. Runoff is slow to medium, and the hazard of water erosion is slight to moderate. The hazard of soil blowing is high. This soil is strongly salt- and sodium-affected at a depth of about 9 inches.

This soil is used as rangeland.

Cropland.—This soil is poorly suited to cultivated crops because of the high content of salts and sodium in the subsoil, which reduces the availability of moisture and plant nutrients and restricts the penetration of roots and moisture into the subsoil. These characteristics drastically limit crop yields.

Rangeland.—The potential native plant community is mainly western wheatgrass, Montana wheatgrass, green needlegrass, and Nuttall saltbush. If the range is excessively grazed, the proportion of these plants decreases and the proportion of blue grama, Sandberg bluegrass, and other perennial short grasses increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,000 pounds per acre of air-dry vegetation in years of above-normal precipitation and 500 pounds in years of below-normal precipitation.

This soil is not suited to seeding because of the high content of sodium and salts. Areas of deteriorated rangeland can be improved by mechanical treatment practices such as contour furrowing and scalping.

Windbreaks.—This soil is poorly suited to windbreaks. It is strongly salt- and sodium-affected, which limits the choice of trees and shrubs to Russian-olive and silver buffaloberry.

Homesite development.—This soil is poorly suited to homesite development. It is limited mainly by slow permeability, shrink-swell potential, and low soil strength. In the construction of basements or foundations for dwellings, the limitation of shrink-swell potential can be overcome by backfilling with suitable material that has low shrink-swell potential. If this soil is used for septic tank absorption fields, the limitation of slow permeability can be overcome by increasing the size of the absorption field or by excavating the trench to a suitable

depth. The field or trench should be backfilled with gravel. Shrinking and swelling and low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations.

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

3—Adger-Absher complex, 0 to 8 percent slopes. This map unit is on fans, terraces, and foot slopes in the northeastern part of the county. Slopes are mainly less than 1,000 feet long. Elevation is 2,000 to 2,500 feet. The average annual precipitation is about 15 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

This unit is about 45 percent Adger silty clay loam and 40 percent Absher clay loam. The Absher soil is in small depressional areas surrounded by the Adger soil.

Included in this unit are small areas of Thoeny, Yawdim, Vida, Shambo, and Weingart soils. Also included are small areas of deep, moderately well drained, strongly salt- and sodium-affected silty clay to clay. Included areas make up about 15 percent of the total acreage. These areas do not adversely affect the use and management of this unit as rangeland.

The Adger soil is deep, well drained, and strongly salt- and sodium-affected. It formed in alluvium. Typically, the surface layer, where mixed to a depth of 7 inches, is grayish brown silty clay loam. The subsoil is mostly light brownish gray silty clay loam 20 inches thick. The substratum to a depth of 60 inches or more is light brownish gray silty clay loam and silt loam.

Permeability is slow, and available water capacity is moderate. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 20 inches. Runoff is slow to medium, and the hazard of water erosion is slight to moderate. The hazard of soil blowing is high. This soil is strongly salt- and sodium-affected at a depth of about 9 inches.

The Absher soil is deep and well drained and is strongly salt-affected and moderately sodium-affected. It formed in alluvium. Typically, the surface layer, where mixed to a depth of 7 inches, is grayish brown clay loam. A thin, hard crust is on the surface. The subsoil is mostly light brownish gray clay loam and clay 20 inches thick. The substratum to a depth of 60 inches or more is mostly light brownish gray clay loam.

Permeability is very slow, and available water capacity is moderate. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 20 inches. Runoff is slow to medium, and the hazard of water erosion is slight to moderate. The hazard of soil blowing is moderate. This soil is strongly salt-affected and moderately sodium-affected at a depth of about 5 inches.

These soils are used as rangeland.

Cropland.—These soils are poorly suited to cultivated crops and hay because of the content of salts and sodium, which reduces the availability of moisture and plant nutrients and restricts the penetration of roots and moisture into the subsoil. These characteristics drastically limit crop yields.

Rangeland.—The potential native plant community on the Adger soil is mainly western wheatgrass, Montana wheatgrass, green needlegrass, and Nuttall saltbush. If the range is excessively grazed, the proportion of these plants decreases and the proportion of blue grama, Sandberg bluegrass, and other perennial short grasses increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,000 pounds per acre of air-dry vegetation in years of above-normal precipitation and 500 pounds in years of below-normal precipitation.

The potential native plant community on the Absher soil is mainly western wheatgrass, green needlegrass, Montana wheatgrass, winterfat, and Nuttall saltbush. If the range is excessively grazed, the proportion of these plants decreases and the proportion of blue grama, Sandberg bluegrass, other perennial short grasses, perennial forbs, and big sagebrush increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 600 pounds per acre of air-dry vegetation in years of above-normal precipitation and 400 pounds in years of below-normal precipitation.

These soils are poorly suited to seeding because of the high content of sodium and salts. Areas of deteriorated rangeland can be improved by mechanical treatment practices such as contour furrowing and scalping.

Windbreaks.—These soils are poorly suited to windbreaks. They are salt- and sodium-affected, which limits the choice of trees and shrubs to Russian-olive and silver buffaloberry.

Homesite development.—These soils are poorly suited to homesite development. They are limited mainly by slow and very slow permeability, shrink-swell potential, and low soil strength. In the construction of basements or foundations for dwellings, the limitation of shrink-swell potential can be overcome by backfilling with suitable material that has low shrink-swell potential. These soils are poorly suited to septic tank absorption fields because of slow and very slow permeability. Shrinking and swelling and low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations.

This map unit is in capability subclass VIs, nonirrigated. The Adger soil is in Clay Pan range site, 10-

to 14-inch precipitation zone, and the Absher soil is in Dense Clay range site, 10- to 14-inch precipitation zone.

4—Aeric Fluvaquents, loamy. These deep soils are on narrow flood plains in the northern part of the county. They formed in alluvium. Slope is 0 to 2 percent. Slopes are mainly less than 250 feet long. Elevation is 1,900 to 2,500 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Fleak, Sunburst, Havre, and Glendive soils. These areas do not adversely affect the use and management of this unit as rangeland.

Aeric Fluvaquents, loamy, are erratically stratified and do not have a typical profile. They range in texture from sandy loam to silty clay loam.

Permeability ranges from slow to moderate, and available water capacity is high. Effective rooting depth is 60 inches or more. These soils have either a permanent or a seasonal high water table. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high. These soils are subject to occasional periods of flooding during high intensity storms and during spring runoff.

These soils are used as rangeland.

Cropland.—These soils are not suited to cultivated crops because of the impracticability of effectively farming the small, odd-shaped areas that make up the unit.

Rangeland.—The potential native plant community on these soils has been altered by the entrenchment of a creek in the soils. It is now mainly little bluestem, green needlegrass, prairie sandreed, slender wheatgrass, and Canada wildrye. If the range is excessively grazed, the proportion of these grasses decreases and the proportion of western wheatgrass, needleandthread, silver sagebrush, and perennial forbs increases. If excessive grazing continues, plants such as annuals, thistles, and Kentucky bluegrass may invade. The potential native plant community produces about 2,800 pounds per acre of air-dry vegetation in years of above-normal precipitation and 2,000 pounds in years of below-normal precipitation.

Grazing should be delayed until the soils are firm and the more desirable forage plants have achieved sufficient growth to withstand grazing pressure. Use of mechanical treatment practices is not practical. To reduce competition of brush with desirable forage plants, control of silver sagebrush is a suitable practice on these soils. Forage yields can be increased by the use of water spreading on some of the larger areas.

Windbreaks.—These soils are poorly suited to windbreaks. It is difficult to select the most suitable trees and shrubs and to plant and maintain them because of the variability of the soils, the configuration of the areas of the unit, and the possible presence of a water table near the surface.

Homesite development.—These soils are poorly suited to homesite development because of the hazard of occasional flooding.

This map unit is in capability subclass VIIw, nonirrigated. It is in Overflow range site, 10- to 14-inch precipitation zone.

5—Alona silt loam, 0 to 8 percent slopes. This deep, well drained, moderately salt-affected and strongly sodium-affected soil is on fans, terraces, and terrace edges in the southwestern and eastern parts of the county. It formed in alluvium. Slopes are mainly 250 feet to more than 1,000 feet long. Elevation is 1,900 to 2,600 feet. The average annual precipitation is about 12 inches in the southwestern part of the county and about 14 inches in the eastern part. The average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit in the eastern part of the county are small areas of Cherry soils; Macar loam, saline; Alona silt loam, saline; and Havrelon loam, saline, on the lower slopes and Cambert soils on the steeper slopes. In the southwestern part of the county are small areas of Lonna silt loam, saline, and Alona silt loam, saline, on the lower slopes and Cambeth soils on the steeper slopes. Also included are small areas of Alona silt loam on the steeper slopes. These areas do not adversely affect the use and management of this unit as rangeland.

Typically, this Alona soil has a surface layer of grayish brown silt loam 5 inches thick. The subsoil is mostly light brownish gray to light gray silty clay loam 17 inches thick. The substratum to a depth of 60 inches or more is light gray silty clay loam.

Permeability is moderately slow, and available water capacity is moderate. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 24 inches. Runoff is slow to medium, and the hazard of water erosion is slight to moderate. The hazard of soil blowing is moderate. This soil is moderately salt-affected and strongly sodium-affected at a depth of about 12 inches.

This soil is used as rangeland.

Cropland.—This soil is poorly suited to cultivated crops because the high content of salts and sodium reduces the amount of moisture available to plants and restricts the penetration of roots and moisture into the subsoil. If the soil is cultivated, the percentage of seedling emergence is reduced by a hard crust that forms on the soil surface as the soil dries following rainfall or irrigation. These characteristics limit crop yields.

Rangeland.—The potential native plant community is mainly western wheatgrass, green needlegrass, alkali bluegrass, and Nuttall saltbush. If the range is

excessively grazed, the proportion of these plants decreases and the proportion of inland saltgrass, needleandthread, perennial short grasses, fringed sagewort, and perennial forbs increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,600 pounds per acre of air-dry vegetation in years of above-normal precipitation and 800 pounds in years of below-normal precipitation.

This soil is not suited to seeding, but it is suited to mechanical treatment practices such as contour furrowing and scalping.

Windbreaks.—This soil is poorly suited to windbreaks. It is salt- and sodium-affected, which limits the choice of trees and shrubs to Russian-olive and silver buffaloberry.

Homesite development.—This soil is poorly suited to homesite development. It is limited mainly by moderately slow permeability, shrink-swell potential, and low soil strength. Buildings can be designed to offset the effects of shrinking and swelling. If the soil is used for septic tank absorption fields, the limitation of moderately slow permeability can be overcome by increasing the size of the absorption field or by excavating the trench to a suitable depth. The field or trench should be backfilled with gravel. Shrinking and swelling and low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations.

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

6—Alona silt loam, saline, 0 to 2 percent slopes. This deep, well drained, strongly salt- and sodium-affected soil is on low terraces along the major drainageways. It formed in alluvium. Slopes are mainly 250 feet to 1,000 feet in length. Elevation is 1,900 to 2,600 feet. The average annual precipitation is about 12 inches in the southwestern part of the county and about 14 inches in the eastern part. The average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit in the east-central part of the county are small areas of Cherry soils; Havrelon loam, saline; Bryant Variant silt loam; and Typic Fluvaquents, saline. In the west-central part of the county are small areas of Lonna and Havre soils and Typic Fluvaquents, saline. These areas do not adversely affect the use and management of this unit as rangeland.

Typically, this Alona soil has a surface layer of grayish brown silt loam 5 inches thick. The subsoil is mostly light brownish gray silty clay loam 17 inches thick. The substratum to a depth of 60 inches or more is light gray silty clay loam.

Permeability is moderately slow, and available water capacity is moderate. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 40 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate. This soil is strongly salt- and sodium-affected at a depth of about 5 inches. It is subject to rare periods of flooding. It receives additional moisture as runoff from surrounding upland soils.

This soil is used as rangeland.

Cropland.—This soil is not suited to cultivated crops because the high content of salts and sodium reduces the availability of moisture and nutrients to the plants and restricts penetration of roots and moisture into the soil. If the soil is cultivated, the percentage of seedling emergence is drastically reduced by a hard crust that forms on the soil surface as the soil dries following rainfall or irrigation.

Rangeland.—The potential native plant community is mainly alkali cordgrass, alkali sacaton, Nuttall alkaligrass, and Nuttall saltbush. If the range is excessively grazed, the proportion of these plants decreases and the proportion of inland saltgrass, western wheatgrass, and bottlebrush squirreltail increases. If excessive grazing continues, plants such as foxtail barley, annual saltbush, other annuals, and weedlike forbs may invade. The potential native plant community produces about 3,300 pounds per acre of air-dry vegetation in years of above-normal precipitation and 2,000 pounds in years of below-normal precipitation.

This soil is not suited to seeding because of the high content of sodium and salts. With increased grazing use, this soil may become more salty and thus produce less forage. Only the more salt-tolerant plant species can grow.

Windbreaks.—This soil is not suited to windbreaks. It is limited mainly by the high content of salts and sodium.

Homesite development.—This soil is poorly suited to homesite development because of the hazard of rare flooding.

This map unit is in capability subclass VIIs, nonirrigated. It is in Saline Lowland range site, 10- to 14-inch precipitation zone.

7—Badland. Badland consists mainly of steep and very steep, barren and nearly barren areas. These areas are nearly vertical escarpments, narrow ridges, isolated buttes, and deeply entrenched coulees and are mainly in the western and northern parts of the county. Badland was formed by active geologic erosion of weakly consolidated, silty and sandy sedimentary beds and of semiconsolidated and consolidated shale. Slope is 25 to 70 percent. Elevation is 1,900 to 3,000 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Cabbart, Cabba, Fleak, Neldore, Benz, Gerdrum, and Vanda soils.

These included soils enhance the use and management of this unit for wildlife habitat, watershed, recreation, and very limited livestock grazing.

Runoff is very rapid, and the hazard of water erosion is very high. The hazard of soil blowing is very high.

This unit is used mainly for wildlife habitat, watershed, recreation, and very limited rangeland. The included soils support grasses, forbs, and shrubs. Grazing is difficult to manage on these soils because of their limited acreage, remoteness of one area from another, and limited accessibility. Extreme care must be taken to prevent overgrazing and subsequent erosion.

Homesite development.—Steepness of slope limits this unit for homesite development.

This map unit is in capability subclass VIIIe, nonirrigated.

8—Banks fine sandy loam. This deep, excessively drained soil is on flood plains and low terraces along the Redwater River, Missouri River, and Sand Creek. It formed in alluvium. Slope is 0 to 2 percent. Slopes are mainly less than 250 feet long. Elevation is 1,900 to 2,600 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Trembles, Havrelon, and Ridgelawn soils. Also included are small areas of soils on short, steep slopes along terrace edges. These areas do not adversely affect the use and management of this unit as rangeland and for irrigated farming.

Typically, this Banks soil has a surface layer of pale brown fine sandy loam 5 inches thick. The upper 11 inches of the underlying material is pale brown fine sandy loam, and the lower part to a depth of 60 inches or more is light brownish gray loamy fine sand.

Permeability is rapid, and available water capacity is low. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 36 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high. This soil is subject to rare periods of flooding during prolonged, high intensity storms. Channeling and deposition are common along streambanks. This soil is droughty.

This soil is used as rangeland and for irrigated farming. The main irrigated crops are wheat, oats, barley, and alfalfa hay.

Cropland.—This soil is suited to irrigated crops. It is limited mainly by the hazard of soil blowing and the low available water capacity. In summer, irrigation is required for maximum production of most crops. Furrow, border, corrugation, and sprinkler irrigation systems are suited to this soil. Leveling is needed in sloping areas for the efficient application and removal of irrigation water. Because this soil is droughty, light and frequent applications of irrigation water are needed. Keeping a cover crop of grasses and legumes on the soil during the nonirrigation season reduces soil blowing.

Rangeland.—The potential native plant community is mainly sand bluestem, prairie sandreed, Indian ricegrass, little bluestem, and sun sedge. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, sand dropseed, perennial short grasses, threadleaf sedge, perennial forbs, and yucca increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 2,000 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,200 pounds in years of below-normal precipitation.

Range seeding of native plants is a suitable practice to prevent excessive soil erosion and to convert land back to rangeland from other uses. Special precautions may be needed to reduce the risks of soil blowing and flooding until the plant cover is reestablished.

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

Homesite development.—This soil is poorly suited to homesite development because of the hazard of rare flooding.

This map unit is in capability subclasses VIe, nonirrigated, and IVe, irrigated. It is in Sandy range site, 10- to 14-inch precipitation zone.

9—Barkof silty clay, 2 to 8 percent slopes. This moderately deep, well drained soil is on foot slopes and side slopes of knolls and low hills in the eastern part of the county. It formed in material derived from semiconsolidated shale. Slopes are mainly less than 250 feet long. Elevation is 1,900 to 3,400 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Cabba, Dast, and Bryant soils. The Cabba and Dast soils are highly susceptible to soil blowing. The Bryant soil does not adversely affect the use and management of this unit for nonirrigated farming and as rangeland.

Typically, this Barkof soil, where mixed to a depth of 7 inches, has a surface layer of grayish brown silty clay. The subsoil is mostly light brownish gray silty clay 19 inches thick. The substratum to a depth of 29 inches is light gray silty clay. Below this to a depth of 60 inches or more is mainly white semiconsolidated shale. Semiconsolidated shale is at a depth of 20 to 40 inches.

Permeability is slow, and available water capacity is low. Effective rooting depth is limited by the semiconsolidated shale at a depth of 20 to 40 inches.

Where this soil is under native vegetation, the average annual wetting depth is 20 to 24 inches. Runoff is slow to medium, and the hazard of water erosion is slight to moderate. The hazard of soil blowing is moderate. This soil is calcareous throughout. It is droughty.

This soil is used as rangeland and for nonirrigated crops. The main nonirrigated crops are wheat, oats, and barley.

Cropland.—This soil is suited to nonirrigated crops. It is limited mainly by the moderate hazards of water erosion and soil blowing, low available water capacity, and the clayey surface layer. The soil is difficult to till when dry, and it is subject to clodding and compaction if it is tilled when wet. The content of soil moisture is optimum for tillage for only a short period. The surface layer of this soil is high in content of lime and low in content of organic matter. Crops respond well to the application of phosphorus and nitrogen. Using green manure crops, barnyard manure, and crop residue increases the organic matter content and fertility. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, stubble mulch tillage, and grassed waterways reduce soil blowing and water erosion.

Rangeland.—The potential native plant community is mainly western wheatgrass, green needlegrass, thickspike wheatgrass, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of Sandberg bluegrass, blue grama, big sagebrush, and perennial forbs increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,800 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,000 pounds in years of below-normal precipitation.

The surface layer is susceptible to water erosion and soil blowing if it is disturbed or the range is overgrazed. Proper grazing use insures good plant vigor and adequate plant cover. Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Areas of deteriorated rangeland can be improved by mechanical treatment practices such as shallow chiseling and scalping.

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

Homesite development.—This soil is poorly suited to homesite development. It is limited mainly by slow permeability, low soil strength, potential for shrinking and swelling, and moderate depth to semiconsolidated shale. In the construction of basements or foundations for dwellings, the limitation of shrink-swell potential can be overcome by backfilling with suitable material that has low shrink-swell potential. This soil is poorly suited to septic tank absorption fields because of slow permeability and depth to semiconsolidated shale. Shrinking and swelling and low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In places, excavation for roads can expose material that is highly susceptible to soil blowing.

This map unit is in capability subclass IIIs, nonirrigated. It is in Clayey range site, 10- to 14-inch precipitation zone.

10—Bascovy silty clay, 2 to 8 percent slopes. This moderately deep, well drained soil is on knolls and foot slopes in the northwestern part of the county. It formed in material derived from consolidated shale. Slopes are mainly 250 feet to more than 1,000 feet long. Elevation is 1,900 to 2,600 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Neldore, Vanda, and Sunburst soils and shale outcroppings. Also included are small areas of soils that have slopes of more than 8 percent. These areas do not adversely affect the use and management of this unit as rangeland.

Typically, this Bascovy soil has a surface layer of grayish brown silty clay 2 inches thick. The subsoil is grayish brown silty clay 9 inches thick. The substratum to a depth of 23 inches is grayish brown silty clay. Below this to a depth of 60 inches or more is olive gray consolidated shale. Consolidated shale is at a depth of 20 to 40 inches.

Permeability is very slow, and available water capacity is low. Effective rooting depth is limited by the consolidated shale at a depth of 20 to 40 inches. Where this soil is under native vegetation, the average annual wetting depth is about 20 inches. Runoff is medium to rapid, and the hazard of water erosion is moderate to high. The hazard of soil blowing is moderate. This soil is droughty.

This soil is used as rangeland.

Cropland.—This soil is poorly suited to cultivated crops because of its low available water capacity and moderate depth to shale, which limits root penetration.

Rangeland.—The potential native plant community is mainly western wheatgrass, green needlegrass, thickspike wheatgrass, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of Sandberg bluegrass, blue grama, big sagebrush, and perennial forbs increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,800 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,000 pounds in years of below-normal precipitation.

Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Areas of deteriorated rangeland can be improved by mechanical treatment practices such as shallow chiseling, scalping, and contour furrowing.

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

Homesite development.—This soil is poorly suited to homesite development. It is limited mainly by very slow permeability, moderate depth to consolidated shale, low soil strength, and shrink-swell potential. If buildings are constructed on this soil, properly designing foundations and footings and diverting runoff away from the buildings help to prevent structural damage as a result of shrinking and swelling. This soil is poorly suited to septic tank absorption fields because of very slow permeability and moderate depth to consolidated shale. Access roads must be designed to control surface runoff and help stabilize cut slopes. Shrinking and swelling and low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations.

This map unit is in capability subclass IVs, nonirrigated. It is in Clayey range site, 10- to 14-inch precipitation zone.

11—Bascovy-Sunburst complex, 15 to 45 percent slopes. This map unit is on uplands in the northwestern part of the county. Slopes are mainly less than 250 feet long. Elevation is 1,900 to 2,600 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

This unit is about 45 percent Bascovy silty clay and about 40 percent Sunburst clay loam. The moderately steep Bascovy soil is on lower side slopes, and the moderately steep to steep Sunburst soil is on upper side slopes and tops of hills and ridges.

Included in this unit are small areas of Neldore and Vanda soils and shale outcroppings. Also included are small areas of less sloping Bascovy and Sunburst soils. Included areas make up about 15 percent of the total acreage. These areas do not adversely affect the use and management of this unit as rangeland.

The Bascovy soil is moderately deep and well drained. It formed in material derived from consolidated shale. Typically, the surface layer is grayish brown silty clay 2 inches thick. The subsoil is grayish brown silty clay 9 inches thick. The substratum to a depth of 23 inches is grayish brown silty clay. Below this, to a depth of 62 inches or more, is olive gray to gray consolidated shale. Consolidated shale is at a depth of 20 to 40 inches.

Permeability is very slow, and available water capacity is low. Effective rooting depth is limited by consolidated shale at a depth of 20 to 40 inches. Where this soil is under native vegetation, the average annual wetting depth is about 20 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate. Consolidated shale is at a depth of 20 to 40 inches. This soil is droughty.

The Sunburst soil is deep and well drained. It formed in glacial till. Typically, the surface layer is grayish brown clay loam 3 inches thick. The upper 16 inches of the underlying material is grayish brown silty clay loam, and the lower part to a depth of 60 inches or more is mostly grayish brown silty clay.

Permeability is slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 16 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is high. This soil is calcareous throughout.

These soils are used as rangeland.

Cropland.—These soils are not suited to cultivated crops because of the steepness of slope.

Rangeland.—The potential native plant community on the Bascovy soil is mainly western wheatgrass, green needlegrass, bluebunch wheatgrass, and sideoats grama. If the range is excessively grazed, the proportion of these grasses decreases and the proportion of perennial short grasses, juniper, perennial forbs, and big sagebrush increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,300 pounds per acre of air-dry vegetation in years of above-normal precipitation and 850 pounds in years of below-normal precipitation.

The potential native plant community on the Sunburst soil is mainly little bluestem, bluebunch wheatgrass, green needlegrass, and sideoats grama. If the range is excessively grazed, the proportion of these grasses decreases and the proportion of native perennial short grasses, threadleaf sedge, perennial forbs, and creeping juniper increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,400 pounds per acre of air-dry vegetation in years of above-normal precipitation and 850 pounds in years of below-normal precipitation.

Steepness of slope limits access by livestock and promotes overgrazing of the less sloping areas. Use of mechanical treatment practices is not practical. These soils are not suited to rangeland seeding because of the steepness of slope.

Windbreaks.—These soils are not suited to windbreaks. They are limited mainly by steepness of slope.

Homesite development.—These soils are poorly suited to homesite development because of the steepness of

slope and the moderate depth to consolidated shale in the Bascovy soil.

This map unit is in capability subclass VIIe, nonirrigated. It is in Thin Clayey range site, 10- to 14-inch precipitation zone.

12—Benz clay loam, 0 to 8 percent slopes. This deep, well drained, strongly salt- and sodium-affected soil is on fans and terraces below sandstone and shale hills in the northern part of the county. It formed in alluvium. Slopes are mainly less than 1,000 feet long. Elevation is 1,900 to 2,600 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Rominell, Yawdim, Weingart, and Fleak soils. These areas do not adversely affect the use and management of this unit as rangeland.

Typically, this Benz soil, where mixed to a depth of 7 inches, has a surface layer of grayish brown clay loam. The underlying material to a depth of 60 inches or more is grayish brown clay loam stratified with thin lenses of fine sandy loam.

Permeability is slow, and available water capacity is moderate. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 24 inches. Runoff is slow to medium, and the hazard of water erosion is slight to moderate. The hazard of soil blowing is moderate. This soil is strongly salt- and sodium-affected at a depth of about 1 inch.

This soil is used as rangeland.

Cropland.—This soil is not suited to nonirrigated crops because the high content of salts and sodium in the surface layer substantially limits crop yields.

Rangeland.—The potential native plant community is mainly western wheatgrass, Montana wheatgrass, alkali sacaton, and Nuttall saltbush. If the range is excessively grazed, the proportion of these plants decreases and the proportion of inland saltgrass, Sandberg bluegrass, bottlebrush squirreltail, perennial forbs, and low sagebrush increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 500 pounds per acre of air-dry vegetation in years of above-normal precipitation and 200 pounds in years of below-normal precipitation.

This soil is not suited to rangeland seeding or mechanical treatment practices because of the high content of sodium and salts.

Windbreaks.—This soil is not suited to windbreaks. It is limited mainly by the high content of salts and sodium.

Homesite development.—This soil is poorly suited to homesite development. It is limited mainly by slow permeability, shrink-swell potential, and low soil strength. In the construction of basements or foundations for dwellings, the limitation of shrink-swell potential can be overcome by backfilling with suitable material that has low shrink-swell potential. If this soil is used for septic tank absorption fields, use of gravel backfill in the absorption line trench, excavated to a suitable depth, helps to compensate for the limitation of slow permeability. Shrinking and swelling and low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations.

This map unit is in capability subclass VIIe, nonirrigated. It is in Saline Upland range site, 10- to 14-inch precipitation zone.

13—Bowbells loam. This deep, well drained soil is in broad, nearly level areas in basins and swales in the northeastern part of the county. It formed in glacial till and local alluvium. Slope is 0 to 2 percent. Slopes are mainly 250 feet to more than 1,000 feet long. Elevation is 2,000 to 2,500 feet. The average annual precipitation is about 15 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Williams and Vida soils. These areas do not adversely affect the use and management of this unit for nonirrigated farming and as rangeland.

Typically, this Bowbells soil has a surface layer of dark grayish brown loam 10 inches thick. The upper 18 inches of the subsoil is dark grayish brown loam and clay loam, and the lower 9 inches is light brownish gray loam. The substratum to a depth of 60 inches or more is grayish brown and light gray clay loam.

Permeability is moderately slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 30 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

Most areas of this soil are used for nonirrigated farming. A few areas are used as rangeland. The main nonirrigated crops are wheat, oats, and barley. If this soil is irrigated, it is prime farmland.

Cropland.—This soil is well suited to nonirrigated crops. It has few limitations. Crop residue left on or near the surface helps to conserve moisture, maintain tilth, and control soil blowing. Areas of this soil in the Wolf Creek drainageway and north of Montana Highway 201 have potential for the formation of saline seeps. Suitable practices for reducing the development of saline seeps are using flexible cropping systems, seeding legumes in recharge areas, and providing surface and subsurface drainage where needed.

Rangeland.—The potential native plant community is mainly big bluestem, little bluestem, green needlegrass, and western wheatgrass. If the range is excessively

grazed, the proportion of big bluestem, little bluestem, and green needlegrass decreases and the proportion of western wheatgrass, needleandthread, silver sagebrush, and rose increases. If excessive grazing continues, plants such as annuals, thistles, Kentucky bluegrass, and other weedlike forbs may invade. The potential native plant community produces about 2,600 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,600 pounds in years of below-normal precipitation.

Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Grazing should be delayed until the soil has drained sufficiently and is firm enough to withstand trampling by livestock. Areas of deteriorated rangeland can be improved by mechanical treatment practices such as scalping and chiseling.

Windbreaks.—This soil is well suited to windbreaks. Suitable trees for planting are Russian-olive, white willow, golden willow, Siberian elm, Siberian crabapple, black hawthorn, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and western sandcherry.

Homesite development.—This soil is poorly suited to homesite development. It is limited mainly by moderately slow permeability, low soil strength, and shrink-swell potential. In the construction of basements or foundations for dwellings, the limitation of shrink-swell potential can be overcome by backfilling with suitable material that has low shrink-swell potential. If this soil is used for septic tank absorption fields, use of gravel backfill in the absorption line trench, excavated to a suitable depth, helps to compensate for the limitation of moderately slow permeability. Shrinking and swelling and low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations.

This map unit is in capability subclass IIIe, nonirrigated. It is in Overflow range site, 10- to 14-inch precipitation zone.

14—Bryant silt loam, 0 to 4 percent slopes. This deep, well drained soil is on fans and terraces in the east-central and southeastern parts of the county. It formed in local alluvium derived from weakly consolidated, silty sedimentary beds. Slopes are mainly more than 1,000 feet long. Elevation is 1,900 to 3,400 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Cambert, Cherry, Shambo, and Farland soils. The Cherry soils are on fans and terraces. They are highly susceptible to soil blowing. The Cambert soils are on foot slopes. They are underlain by root-limiting, weakly consolidated, silty sedimentary beds at a depth of 20 to 40 inches. The Shambo and Farland soils do not adversely affect the use and management of this unit for nonirrigated farming and as rangeland.

Typically, this Bryant soil has a surface layer of dark grayish brown silt loam 4 inches thick. The upper 10 inches of the subsoil is dark grayish brown and grayish brown silt loam, and the lower 10 inches is light brownish gray silty clay loam. The substratum to a depth of 60 inches or more is mostly light gray silty clay loam.

Permeability is moderate, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 30 inches. Runoff is slow, and the hazard of water erosion is slight to moderate. The hazard of soil blowing is moderate. This soil is calcareous below a depth of 9 inches.

This soil is used mainly for nonirrigated farming. It is also used as rangeland. The main nonirrigated crops are wheat, oats, and barley. If this soil is irrigated, it is prime farmland.

Cropland.—This soil is well suited to nonirrigated crops. It is limited mainly by the hazards of soil blowing and water erosion. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, stubble mulch tillage, and grassed waterways reduce soil blowing and water erosion.

Rangeland.—The potential native plant community is mainly western wheatgrass, green needlegrass, little bluestem, bluebunch wheatgrass, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, perennial short grasses, threadleaf sedge, fringed sagewort, and silver sagebrush increases. If excessive grazing continues, plants such as red threeawn, annuals, and weedlike forbs may invade. The potential native plant community produces about 1,800 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,200 pounds in years of below-normal precipitation.

The surface layer is susceptible to water erosion and soil blowing if it is disturbed or the range is overgrazed. Proper grazing use insures good plant vigor and adequate plant cover. Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Areas of deteriorated rangeland can be improved by mechanical treatment practices such as shallow chiseling and scalping.

Windbreaks.—This soil is well suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian elm, white willow, golden willow, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, skunkbush sumac, and silver buffaloberry.

Homesite development.—This soil is suited to homesite development. It is limited mainly by low soil

strength, shrink-swell potential, and moderate permeability. In the construction of basements or foundations for dwellings, the limitation of shrink-swell potential can be overcome by backfilling with suitable material that has low shrink-swell potential. If this soil is used for septic tank absorption fields, use of gravel backfill in the absorption line trench, excavated to a suitable depth, helps to compensate for the limitation of moderate permeability. Shrinking and swelling and low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations.

This map unit is in capability subclass IIIe, nonirrigated. It is in Silty range site, 10- to 14-inch precipitation zone.

15—Bryant silt loam, 4 to 8 percent slopes. This deep, well drained soil is on fans and foot slopes in the southeastern and east-central parts of the county. It formed in local alluvium derived from weakly consolidated, silty sedimentary beds. Slopes are mainly 250 to 1,000 feet long. Elevation is 1,900 to 3,400 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Cambert, Cherry, and Shambo soils. The Cherry soils are on fans and are highly susceptible to soil blowing. The Cambert soils are on the sides and tops of low hills. They are underlain by root-limiting, weakly consolidated, silty sedimentary beds at a depth of 20 to 40 inches. The Shambo soils do not adversely affect the use and management of this unit for nonirrigated farming or as rangeland.

Typically, this Bryant soil has a surface layer of dark grayish brown silt loam 4 inches thick. The upper 10 inches of the subsoil is dark grayish brown and grayish brown silt loam, and the lower 10 inches is light brownish gray silty clay loam. The substratum to a depth of 60 inches or more is mostly light gray silty clay loam.

Permeability is moderate, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 30 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate. This soil is calcareous below a depth of 9 inches.

This soil is used mainly for nonirrigated farming. It is also used as rangeland. The main nonirrigated crops are wheat, oats, and barley.

Cropland.—This soil is well suited to nonirrigated crops. It is limited mainly by the hazards of soil blowing and water erosion. Minimum tillage, contour cultivation, stripcropping, tall grass barriers, grassed waterways, and return of crop residue to the soil reduce soil blowing and water erosion. Tall grass barriers also reduce evaporation and trap snow, which increases the amount of moisture in the soil. Return of crop residue also helps to maintain good soil tilth. Chiseling stubble fields in fall on the contour or across the slope reduces runoff and water erosion.

Rangeland.—The potential native plant community is mainly western wheatgrass, green needlegrass, little bluestem, bluebunch wheatgrass, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, perennial short grasses, threadleaf sedge, fringed sagewort, and silver sagebrush increases. If excessive grazing continues, plants such as red threeawn, annuals, and weedlike forbs may invade. The potential native plant community produces about 1,800 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,200 pounds in years of below-normal precipitation.

The surface layer is susceptible to water erosion and soil blowing if it is disturbed or the range is overgrazed. Proper grazing use insures good plant vigor and adequate plant cover. Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Areas of deteriorated rangeland can be improved by mechanical treatment practices such as shallow chiseling and scalping.

Windbreaks.—This soil is well suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian elm, white willow, golden willow, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, skunkbush sumac, and silver buffaloberry.

Homesite development.—This soil is suited to homesite development. It is limited mainly by low soil strength, shrink-swell potential, and moderate permeability. In the construction of basements or foundations for dwellings, the limitation of shrink-swell potential can be overcome by backfilling with suitable material that has low shrink-swell potential. If this soil is used for septic tank absorption fields, use of gravel backfill in the absorption line trench, excavated to a suitable depth, helps to compensate for the limitation of moderate permeability. Shrinking and swelling and low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations.

This map unit is in capability subclass IIIe, nonirrigated. It is in Silty range site, 10- to 14-inch precipitation zone.

16—Bryant-Cambert complex, 2 to 8 percent slopes. This map unit is on uplands in the east-central and southeastern parts of the county. Slopes are mainly 250 to 1,000 feet long. Elevation is 1,900 to 3,400 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

This unit is about 45 percent Bryant silt loam and 40 percent Cambert loam. The gently sloping Bryant soil is on the lower side slopes, on foot slopes, and in swales. The gently sloping to moderately sloping Cambert soil is on the upper side slopes and tops of hills and ridges.

Included in this unit are small areas of Shambo, Cabba, Dast, and Macar soils. Included areas make up about 15 percent of the total acreage. The shallow Cabba soils are on the tops of low hills. They are underlain by root-limiting, weakly consolidated, silty sedimentary beds at a depth of 10 to 20 inches and are highly susceptible to soil blowing. The Dast and Macar soils are highly susceptible to soil blowing. The Shambo soils do not adversely affect the use and management of this unit for nonirrigated farming or as rangeland.

The Bryant soil is deep and well drained. It formed in local alluvium derived from weakly consolidated, silty sedimentary beds. Typically, the surface layer is dark grayish brown silt loam 4 inches thick. The upper 10 inches of the subsoil is dark grayish brown and grayish brown silt loam, and the lower 10 inches is light brownish gray silty clay loam. The substratum to a depth of 60 inches or more is mostly light gray silty clay loam.

Permeability is moderate, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 30 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate. This soil is calcareous below a depth of 9 inches.

The Cambert soil is moderately deep and well drained. It formed in material derived from weakly consolidated, silty sedimentary beds. Typically, the surface layer is brown loam 4 inches thick. The subsoil is mostly brown loam 9 inches thick. The substratum to a depth of 26 inches is very pale brown silty clay loam. Below this to a depth of 60 inches or more is pale yellow and light gray weakly consolidated, silty sedimentary beds. Sedimentary beds are at a depth of 20 to 40 inches.

Permeability is moderate, and available water capacity is moderate. Effective rooting depth is limited by the sedimentary beds at a depth of 20 to 40 inches. Where this soil is under native vegetation, the average annual wetting depth is 20 to 30 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate. This soil is calcareous below a depth of 9 inches.

These soils are used for nonirrigated farming or as rangeland. The main nonirrigated crops are wheat, oats, and barley.

Cropland.—These soils are well suited to nonirrigated crops. They are limited mainly by the hazards of soil blowing and water erosion. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, stubble mulch tillage, and grassed waterways reduce soil blowing and water erosion.

Rangeland.—The potential native plant community is mainly western wheatgrass, green needlegrass, little bluestem, bluebunch wheatgrass, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, perennial short grasses, threadleaf sedge, fringed sagewort, silver sagebrush, and perennial forbs increases. If excessive grazing continues, plants such as annuals, weedlike forbs, red threeawn, and Kentucky bluegrass may invade. The potential native plant community on the Bryant soil produces about 1,800 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,200 pounds in years of below-normal precipitation. The potential native plant community on the Cambert soil produces about 1,600 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,000 pounds in years of below-normal precipitation.

The surface layer of these soils is susceptible to water erosion and soil blowing if it is disturbed or the range is overgrazed. Proper grazing use insures good plant vigor and adequate plant cover. Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Areas of deteriorated rangeland can be improved by mechanical treatment practices such as shallow chiseling and scalping.

Windbreaks.—The Bryant soil is well suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian elm, white willow, golden willow, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, skunkbush sumac, and silver buffaloberry.

The Cambert soil is suited to windbreaks, but the limited moisture supply restricts the choice of trees and shrubs. Suitable trees for planting are Russian-olive, Siberian elm, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, and skunkbush sumac.

Homesite development.—These soils are poorly suited to homesite development. The Bryant soil is limited mainly by low soil strength, shrink-swell potential, and moderate permeability. In the construction of basements or foundations for dwellings, the limitation of shrink-swell potential can be overcome by backfilling with suitable material that has low shrink-swell potential. If this soil is used for septic tank absorption fields, use of gravel backfill in the absorption line trench, excavated to a suitable depth, helps to compensate for the limitation of moderate permeability. Shrinking and swelling and low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations.

The Cambert soil is limited mainly by low soil strength and slow permeability of the underlying sedimentary beds. This soil is poorly suited to septic tank absorption fields because of the slow permeability of the underlying

sedimentary beds. Deep cuts needed to provide nearly level road surfaces can expose sedimentary beds that can easily be excavated. Low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome this limitation.

This map unit is in capability subclass IIIe, nonirrigated. It is in Silty range site, 10- to 14-inch precipitation zone.

17—Bryant Variant silt loam, 0 to 2 percent slopes. This deep, moderately well drained, strongly salt-affected and moderately sodium-affected soil is on terraces in the east-central and northeastern parts of the county. It formed in alluvium. Slopes are mainly 250 to 1,000 feet long. Elevation is 1,900 to 3,400 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Alona silt loam; Alona silt loam, saline; Havrelon soils, saline; and Bryant soils. These areas do not adversely affect the use and management of this unit as rangeland.

Typically, this Bryant Variant soil has a surface layer of dark grayish brown silt loam 10 inches thick. The upper 5 inches of the subsoil is grayish brown silt loam, and the lower 9 inches is light brownish gray silty clay loam. The upper 9 inches of the substratum is light brownish gray silt loam, and the lower part to a depth of 60 inches or more is light gray silty clay loam.

Permeability is moderate, and available water capacity is moderate. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 30 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate. This soil is strongly salt-affected and moderately sodium-affected from the soil surface to a depth of 40 inches.

This soil is used as rangeland.

Cropland.—This soil is poorly suited to cultivated crops because the high content of salts reduces the availability of moisture and nutrients to plants. If this soil is cultivated, the percentage of seedling emergence is reduced by the hard crust that forms on the soil surface as the soil dries following rainfall or irrigation. These characteristics drastically limit crop yields.

Rangeland.—The potential native plant community is mainly alkali cordgrass, alkali sacaton, Nuttall alkaligrass, Nuttall saltbush, tall sedges, and alkali bluegrass. If the range is excessively grazed, the proportion of these plants decreases and the proportion of western wheatgrass, inland saltgrass, and bottlebrush squirreltail increases. If excessive grazing continues, plants such as foxtail barley, annual saltbush, and other annuals and weedlike forbs may invade. The potential native plant community produces about 3,300 pounds per acre of air-dry vegetation in years of above-normal precipitation and 2,000 pounds in years of below-normal precipitation.

Grazing should be delayed until the soil is firm and the more desirable forage plants have achieved sufficient growth to withstand grazing pressure. With increased grazing use, this soil may become more salty and thus produce less forage. Only the more salt-tolerant plants will grow. This soil is not suited to rangeland seeding or mechanical treatment practices because of the high content of salts in the soil.

Windbreaks.—This soil is not suited to windbreaks. It is limited mainly by the high content of salts.

Homesite development.—This soil is poorly suited to homesite development. It is limited mainly by low soil strength, shrink-swell potential, moderate permeability, and wetness. Wetness can be reduced by installing drain tile around footings. The soil is poorly suited to septic tank absorption fields because of wetness. Shrinking and swelling and low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations.

This map unit is in capability subclass VIIs, nonirrigated. It is in Saline Lowland range site, 10- to 14-inch precipitation zone.

18—Busby fine sandy loam, 2 to 8 percent slopes. This deep, well drained soil is on fans and foot slopes in the western part of the county. It formed in alluvium. Slopes are mainly 250 feet to more than 1,000 feet long. Elevation is 1,900 to 2,600 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Twilight, Cambeth, Yetull, and Yamac soils. The moderately deep Twilight and Cambeth soils are on upper side slopes and on tops of low hills. They are droughty and are lower in productivity than this Busby soil. The deep Yetull soils are in swales and in areas protected from the prevailing winds. They are droughty and are low in productivity. The Yamac soils do not adversely affect the use and management of this unit as rangeland and for nonirrigated farming.

Typically, this Busby soil has a surface layer of grayish brown fine sandy loam 5 inches thick. The subsoil is light olive brown fine sandy loam 6 inches thick. The substratum to a depth of 60 inches or more is mostly light brownish gray fine sandy loam.

Permeability is moderately rapid, and available water capacity is moderate. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 30 inches. Runoff is slow, and the hazard of water erosion is slight to moderate. The hazard of soil blowing is high. This soil is calcareous throughout.

This soil is used mainly as rangeland. It is also used for nonirrigated farming. The main nonirrigated crops are wheat, oats, and barley.

Cropland.—This soil is suited to nonirrigated crops. It is limited mainly by the high hazard of soil blowing. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, and stubble mulch tillage reduce soil blowing. Tall grass barriers also trap snow, which increases the amount of moisture in the soil.

Rangeland.—The potential native plant community is mainly prairie sandreed, little bluestem, big bluestem, and needleandthread. If the range is excessively grazed, the proportion of prairie sandreed, little bluestem, and big bluestem decreases and the proportion of needleandthread, perennial short grasses, threadleaf sedge, perennial forbs, and yucca increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,800 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,200 pounds in years of below-normal precipitation.

Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Areas of deteriorated rangeland can be improved by mechanical treatment practices such as shallow chiseling and scalping.

Windbreaks.—This soil is suited to windbreaks, but the limited moisture supply restricts the choice of trees and shrubs. Suitable trees for planting are Russian-olive, Siberian elm, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, and skunkbush sumac.

Homesite development.—This soil is well suited to homesite development. It has few limitations. In places, excavation for roads can expose material that is highly susceptible to soil blowing.

This map unit is in capability subclass IVe, nonirrigated. It is in Sandy range site, 10- to 14-inch precipitation zone.

19—Busby fine sandy loam, 8 to 15 percent slopes. This deep, well drained soil is on fans and side slopes of hills in the western part of the county. It formed in alluvium. Slopes are mainly less than 1,000 feet long. Elevation is 1,900 to 2,600 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Fleak, Cabbart, Yawdim, and Yetull soils. The shallow Fleak, Cabbart, and Yawdim soils and the deep Yetull soils are droughty and are low in productivity.

Typically, this Busby soil has a surface layer of grayish brown fine sandy loam 5 inches thick. The subsoil is light olive brown fine sandy loam 6 inches thick. The substratum to a depth of 60 inches or more is mostly light brownish gray fine sandy loam.

Permeability is moderately rapid, and available water capacity is moderate. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 28 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high. This soil is calcareous throughout.

Most areas of this soil are used as rangeland. A few areas are used for nonirrigated farming. The main nonirrigated crops are wheat, oats, and barley.

Cropland.—This soil is suited to nonirrigated crops. It is limited mainly by the hazards of soil blowing and water erosion. Minimum tillage, contour cultivation, stripcropping, tall grass barriers, grassed waterways, and return of crop residue to the soil reduce soil blowing and water erosion. Tall grass barriers also reduce evaporation and trap snow, which increases the amount of moisture in the soil. Return of crop residue also helps to maintain good soil tilth. Chiseling stubble fields in fall on the contour or across the slope reduces runoff and water erosion.

Rangeland.—The potential native plant community is mainly prairie sandreed, little bluestem, big bluestem, and needleandthread. If the range is excessively grazed, the proportion of prairie sandreed, little bluestem, and big bluestem decreases and the proportion of needleandthread, perennial short grasses, threadleaf sedge, perennial forbs, and yucca increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,800 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,200 pounds in years of below-normal precipitation.

The surface layer is susceptible to water erosion and soil blowing if it is disturbed or the range is overgrazed. Proper grazing use insures good plant vigor and adequate plant cover. Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Areas of deteriorated rangeland can be improved by mechanical practices such as shallow chiseling and scalping.

Windbreaks.—This soil is suited to windbreaks, but the limited moisture supply restricts the choice of trees and shrubs. Suitable trees for planting are Russian-olive, Siberian elm, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, and skunkbush sumac.

Homesite development.—This soil is well suited to homesite development. In places, excavation for roads can expose material that is highly susceptible to soil blowing. Slope is a concern in installing septic tank absorption fields. Absorption lines should be installed on the contour.

This map unit is in capability subclass IVe, nonirrigated. It is in Sandy range site, 10- to 14-inch precipitation zone.

20—Busby-Fleak complex, 15 to 45 percent slopes. This map unit is on uplands, mostly in the west-central and northwestern parts of the county. Slopes are mainly

less than 2,500 feet long. Elevation is 1,900 to 2,600 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

This unit is about 40 percent Busby fine sandy loam and about 40 percent Fleak loamy sand. The moderately steep Busby soil is on fans and side slopes, and the moderately steep to steep Fleak soil is on the tops of ridges and hills.

Included in this unit are small areas of Yamac and Sunburst soils and small areas of sandstone and shale outcroppings. Also included are small areas of soils that have slopes of more than 45 percent. Included areas make up about 20 percent of the total acreage. These areas do not adversely affect the use and management of this unit as rangeland.

The Busby soil is deep and well drained. It formed in alluvium. Typically, the surface layer is grayish brown fine sandy loam 5 inches thick. The subsoil is light olive brown fine sandy loam 6 inches thick. The substratum to a depth of 60 inches or more is mostly light brownish gray fine sandy loam.

Permeability is moderately rapid, and available water capacity is moderate. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 28 inches. Runoff is medium, and the hazard of water erosion is high. The hazard of soil blowing is high. This soil is calcareous throughout.

The Fleak soil is shallow and somewhat excessively drained. It formed in material derived from weakly consolidated, sandy sedimentary beds. Typically, the surface layer, where mixed to a depth of 7 inches, is olive brown loamy sand. The underlying material to a depth of 16 inches is olive loamy sand. Below this to a depth of 60 inches or more are mostly light olive brown, weakly consolidated, sandy sedimentary beds. Sedimentary beds are at a depth of 10 to 20 inches.

Permeability is rapid, and available water capacity is very low. Effective rooting depth is limited by the sedimentary beds at a depth of 10 to 20 inches. Where this soil is under native vegetation, the average annual wetting depth is 10 to 20 inches. Runoff is medium, and the hazard of water erosion is high. The soil is droughty.

These soils are used as rangeland.

Cropland.—These soils are not suited to cultivated crops because of the steepness of slope.

Rangeland.—The potential native plant community on the Busby soil is mainly prairie sandreed, little bluestem, big bluestem, and needleandthread. If the range is excessively grazed, the proportion of prairie sandreed, little bluestem, and big bluestem decreases and the proportion of needleandthread, perennial short grasses, threadleaf sedge, perennial forbs, and yucca increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,800 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,200 pounds in years of below-normal precipitation.

The potential native plant community on the Fleak soil is mainly prairie sandreed, little bluestem, plains muhly, and needleandthread. If the range is excessively grazed, the proportion of prairie sandreed, little bluestem, and plains muhly decreases and the proportion of needleandthread, perennial short grasses, threadleaf sedge, yucca, and perennial forbs increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,200 pounds per acre of air-dry vegetation in years of above-normal precipitation and 700 pounds in years of below-normal precipitation.

Steepness of slope limits access by livestock and promotes overgrazing of the less sloping areas of these soils. Use of mechanical treatment practices is not practical.

Windbreaks.—These soils are not suited to windbreaks because of the steepness of slope.

Homesite development.—These soils are poorly suited to homesite development because of the steepness of slope.

This map unit is in capability subclass VIIe, nonirrigated. The Busby soil is in Sandy range site, 10- to 14-inch precipitation zone, and the Fleak soil is in Shallow range site, 10- to 14-inch precipitation zone.

21—Busby-Twilight fine sandy loams, 2 to 8 percent slopes. This map unit is on uplands in the western part of the county. Slopes are mainly less than 1,000 feet long. Elevation is 1,900 to 2,600 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 43 degrees F and the average frost-free season is about 115 days.

This unit is about 55 percent Busby fine sandy loam and about 30 percent Twilight fine sandy loam. The Busby soil is on fans and foot slopes and in swales, and the Twilight soil is on the side slopes and tops of hills and knolls.

Included in this unit are small areas of Cabbart, Fleak, Chinook, and Rominell soils. Included areas make up about 15 percent of the total acreage. The shallow, well drained Cabbart and Fleak soils are on the upper side slopes and tops of ridges and hills. They are droughty and low in productivity. The deep, salt- and sodium-affected Rominell soils are on the lower foot slopes and fans. The high content of salts in these soils reduces the moisture available for plants, and the high content of sodium in the subsoil restricts penetration by roots and moisture. These characteristics limit crop yields. The Chinook soils do not adversely affect the use and management of this unit as rangeland or for nonirrigated farming.

The Busby soil is deep and well drained. It formed in alluvium. Typically, the surface layer is grayish brown fine sandy loam 5 inches thick. The subsoil is light olive brown fine sandy loam 6 inches thick. The substratum to a depth of 60 inches or more is mostly light brownish gray fine sandy loam.

Permeability is moderately rapid, and available water capacity is moderate. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 30 inches. Runoff is slow, and the hazard of water erosion is slight to moderate. The hazard of soil blowing is high. This soil is calcareous throughout.

The Twilight soil is moderately deep and well drained. It formed in material derived from weakly consolidated, sandy sedimentary beds. Typically, the surface layer is brown fine sandy loam 5 inches thick. The upper 5 inches of the subsoil is brown fine sandy loam, and the lower 6 inches is pale brown fine sandy loam. The substratum to a depth of 25 inches is light brownish gray sandy loam. Below this to a depth of 60 inches or more are light brownish gray, weakly consolidated sedimentary beds. Sedimentary beds are at a depth of 20 to 40 inches.

Permeability is moderately rapid, and available water capacity is low. Effective rooting depth is limited by the sedimentary beds at a depth of 20 to 40 inches. Where this soil is under native vegetation, the average annual wetting depth is 20 to 30 inches. Runoff is slow to medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high. The soil is droughty.

Most areas of these soils are used as rangeland. A few areas are used for nonirrigated farming. The main nonirrigated crops are wheat, oats, and barley.

Cropland.—These soils are suited to nonirrigated crops. They are limited mainly by the high hazard of soil blowing and by the droughtiness of the Twilight soil. Because of the droughtiness, successful crop production depends on receiving average or above-average rainfall during the early part of the growing season. Minimum tillage, tall grass barriers, stripcropping, and stubble mulch tillage conserve moisture and reduce soil blowing.

Rangeland.—The potential native plant community is mainly prairie sandreed, little bluestem, big bluestem, and needleandthread. If the range is excessively grazed, the proportion of prairie sandreed, little bluestem, and big bluestem decreases and the proportion of needleandthread, perennial short grasses, threadleaf sedge, perennial forbs, and yucca increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community on both soils produces about 1,800 pounds per acre of air-dry vegetation in years of above-normal precipitation. In years of below-normal precipitation, the potential native plant community produces about 1,200 pounds of air-dry vegetation on the Busby soil and 1,000 pounds on the Twilight soil.

The surface layer of these soils is susceptible to water erosion and soil blowing if it is disturbed or the range is overgrazed. Proper grazing use insures good plant vigor and adequate plant cover. Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Areas of deteriorated rangeland can be improved by mechanical treatment practices such as shallow chiseling and scalping.

Windbreaks.—The Busby soil is suited to windbreaks, but the limited moisture supply restricts the choice of trees and shrubs. Suitable trees for planting are Russian-olive, Siberian elm, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, and skunkbush sumac.

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

Homesite development.—These soils are well suited to homesite development. They have few limitations. In places, excavation for roads can expose material that is susceptible to soil blowing.

This map unit is in capability subclass IVe, nonirrigated. It is in Sandy range site, 10- to 14-inch precipitation zone.

22—Busby-Twilight-Fleak complex, 8 to 15 percent slopes. This map unit is on uplands in the western part of the county. Elevation is 1,900 to 2,600 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

This unit is about 40 percent Busby fine sandy loam, 30 percent Twilight fine sandy loam, and 20 percent Fleak loamy sand. The Busby soil is in swales and on fans and lower side slopes, the Twilight soil is on side slopes, and the Fleak soil is on the tops of hills and ridges.

Included in this unit are small areas of Cabbart, Yamac, and Rominell soils and small areas of sandstone and shale outcroppings. Included areas make up about 10 percent of the total acreage. These areas do not adversely affect the use and management of this unit as rangeland.

The Busby soil is deep and well drained. It formed in alluvium. Typically, the surface layer is grayish brown fine sandy loam 5 inches thick. The subsoil is light olive brown fine sandy loam 6 inches thick. The substratum to a depth of 60 inches or more is mostly light brownish gray fine sandy loam.

Permeability is moderately rapid, and available water capacity is moderate. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 30 inches. Runoff is medium, and the hazard of water

erosion is moderate. The hazard of soil blowing is high. This soil is calcareous throughout.

The Twilight soil is moderately deep and well drained. It formed in material derived from weakly consolidated, sandy sedimentary beds. Typically, the surface layer is brown fine sandy loam 5 inches thick. The upper 5 inches of the subsoil is brown fine sandy loam, and the lower 6 inches is pale brown fine sandy loam. The substratum to a depth of 25 inches is light brownish gray sandy loam. Below this to a depth of 60 inches or more are light brownish gray, weakly consolidated, sandy sedimentary beds. Sedimentary beds are at a depth of 20 to 40 inches.

Permeability is moderately rapid, and available water capacity is low. Effective rooting depth is limited by the sedimentary beds at a depth of 20 to 40 inches. Where this soil is under native vegetation, the average annual wetting depth is 20 to 30 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high. The soil is droughty.

The Fleak soil is shallow and somewhat excessively drained. It formed in material derived from weakly consolidated, sandy sedimentary beds. Typically the surface layer, where mixed to a depth of 7 inches, is olive brown loamy sand. The underlying material to a depth of 16 inches is olive loamy sand. Below this to a depth of 60 inches or more are mostly light olive brown, weakly consolidated, sandy sedimentary beds. Sedimentary beds are at a depth of 10 to 20 inches.

Permeability is rapid, and available water capacity is very low. Effective rooting depth is limited by the sedimentary beds at a depth of 10 to 20 inches. Where this soil is under native vegetation, the average annual wetting depth is 10 to 20 inches. Runoff is slow to medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high. The soil is droughty.

These soils are used as rangeland.

Cropland.—The Twilight and Fleak soils are poorly suited to cultivated crops because they are droughty and thus are low in productivity.

Rangeland.—The potential native plant community on the Busby and Twilight soils is mainly prairie sandreed, little bluestem, big bluestem, and needleandthread. If the range is excessively grazed, the proportion of prairie sandreed, little bluestem, and big bluestem decreases and the proportion of needleandthread, perennial short grasses, threadleaf sedge, perennial forbs, and yucca increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community on both soils produces about 1,800 pounds per acre of air-dry vegetation in years of above-normal precipitation. In years of below-normal precipitation, the potential native plant community produces about 1,200 pounds per acre of air-dry vegetation on the Busby soil and about 1,000 pounds on the Twilight soil.

The potential native plant community on the Fleak soil is mainly prairie sandreed, little bluestem, plains muhly, and needleandthread. If the range is excessively grazed, the proportion of prairie sandreed, little bluestem, and plains muhly decreases and the proportion of needleandthread, perennial short grasses, threadleaf sedge, yucca, and perennial forbs increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,200 pounds per acre of air-dry vegetation in years of above-normal precipitation and 700 pounds in years of below-normal precipitation.

The Fleak soil is not suited to practices such as seeding, shallow chiseling, and scalping because it is extremely droughty and is more susceptible to soil blowing and water erosion if it is disturbed. Reestablishing plant cover is difficult. The surface layer of the Busby and Twilight soils is susceptible to water erosion and soil blowing if it is disturbed or the range is overgrazed. Proper grazing use insures good plant vigor and adequate plant cover. These soils are suited to seeding and mechanical treatment practices. All tillage should be on the contour or across the slope.

Windbreaks.—The Busby soil is suited to windbreaks, but the limited moisture supply restricts the choice of trees and shrubs. Suitable trees for planting are Russian-olive, Siberian elm, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, and skunkbush sumac.

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

The Fleak soil is not suited to windbreaks. It is limited mainly by the very low available water capacity.

Homesite development.—These soils are suited to homesite development. They have few limitations. In places, excavation for roads can expose material that is highly susceptible to soil blowing. Slope is a concern in installing septic tank absorption fields. Absorption lines should be installed on the contour.

This map unit is in capability subclass VIe, nonirrigated. The Busby and Twilight soils are in Sandy range site, 10- to 14-inch precipitation zone, and the Fleak soil is in Shallow range site, 10- to 14-inch precipitation zone.

23—Busby-Yamac-Fleak complex, 15 to 45 percent slopes. This map unit is on uplands, mostly in the west-central and northwestern parts of the county. Slopes are mainly less than 250 feet long. Elevation is 1,900 to 2,600 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

This unit is about 35 percent Busby fine sandy loam, 30 percent Yamac loam, and 25 percent Fleak loamy sand. The moderately steep Busby and Yamac soils are on side slopes and fans, and the moderately steep to steep Fleak soil is on the tops of hills and ridges.

Included in this unit are small areas of Kremlin, Yetull, Sunburst, and Hillon soils and small areas of sandstone outcroppings. Also included are small areas of soils that have slopes of less than 15 percent. Included areas make up about 10 percent of the total acreage. These areas do not adversely affect the use and management of this unit as rangeland.

The Busby soil is deep and well drained. It formed in alluvium. Typically, the surface layer is grayish brown fine sandy loam 5 inches thick. The subsoil is light olive brown fine sandy loam 6 inches thick. The substratum to a depth of 60 inches or more is mostly light brownish gray fine sandy loam.

Permeability is moderately rapid, and available water capacity is moderate. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 30 inches. Runoff is medium, and the hazard of water erosion is high. The hazard of soil blowing is high. This soil is calcareous throughout.

The Yamac soil is deep and well drained. It formed in alluvium. Typically, the surface layer is grayish brown loam 4 inches thick. The upper 7 inches of the subsoil is olive loam, and the lower 8 inches is grayish brown loam. The substratum to a depth of 60 inches or more is pale olive loam.

Permeability is moderate, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 21 inches. Runoff is medium, and the hazard of water erosion is high. The hazard of soil blowing is high. This soil is calcareous throughout.

The Fleak soil is shallow and somewhat excessively drained. It formed in material derived from weakly consolidated, sandy sedimentary beds. Typically, the surface layer, where mixed to a depth of 7 inches, is olive brown loamy sand. The underlying material to a depth of 16 inches is mostly olive loamy sand. Below this to a depth of 60 inches or more are mostly light olive brown, weakly consolidated, sandy sedimentary beds. Sedimentary beds are at a depth of 10 to 20 inches.

Permeability is rapid, and available water capacity is very low. Effective rooting depth is limited by the sedimentary beds at a depth of 10 to 20 inches. Where this soil is under native vegetation, the average annual wetting depth is 10 to 20 inches. Runoff is medium, and the hazard of water erosion is high. The hazard of soil blowing is high. The soil is droughty.

These soils are used as rangeland.

Cropland.—These soils are not suited to cultivated crops because of steepness of slope.

Rangeland.—The potential native plant community on the Busby soil is mainly prairie sandreed, little bluestem, big bluestem, and needleandthread. If the range is excessively grazed, the proportion of prairie sandreed, little bluestem, and big bluestem decreases and the proportion of needleandthread, perennial short grasses, threadleaf sedge, and perennial forbs increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,800 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,000 pounds in years of below-normal precipitation.

The potential native plant community on the Yamac soil is mainly little bluestem, bluebunch wheatgrass, sideoats grama, plains muhly, western wheatgrass, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, perennial short grasses, fringed sagewort, and perennial forbs increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,400 pounds per acre of air-dry vegetation in years of above-normal precipitation and 800 pounds in years of below-normal precipitation.

The potential native plant community on the Fleak soil is mainly prairie sandreed, little bluestem, plains muhly, and needleandthread. If the range is excessively grazed, the proportion of prairie sandreed, little bluestem, and plains muhly decreases and the proportion of needleandthread, perennial short grasses, threadleaf sedge, yucca, and perennial forbs increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,200 pounds per acre of air-dry vegetation in years of above-normal precipitation and 700 pounds in years of below-normal precipitation.

Steepness of slope limits access by livestock and promotes overgrazing of the less sloping areas of these soils. The surface layer is susceptible to water erosion and soil blowing if it is disturbed or the range is overgrazed. Proper grazing use insures good plant vigor and adequate plant cover. Use of mechanical treatment practices is not practical. These soils are not suited to rangeland seeding because of the steepness of slope.

Windbreaks.—These soils are not suited to windbreaks because of the steepness of slope.

Homesite development.—These soils are poorly suited to homesite development because of the steepness of slope.

This map unit is in capability subclass VIIe, nonirrigated. The Busby soil is in Sandy range site, 10- to 14-inch precipitation zone; the Yamac soil is in Thin Silty range site, 10- to 14-inch precipitation zone; and the Fleak soil is in Shallow range site, 10- to 14-inch precipitation zone.

24—Busby-Yetull fine sandy loams, 2 to 8 percent slopes. This map unit is on uplands in the western part of the county. Slopes are mainly less than 1,000 feet long. Elevation is 1,900 to 2,600 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

This unit is about 50 percent Busby fine sandy loam and about 40 percent Yetull fine sandy loam. The Busby soil is on fans, foot slopes, and side slopes, and the Yetull soil is on fans and foot slopes and in areas that are protected from the prevailing wind.

Included in this unit are small areas of Twilight, Chinook, and Cabbart soils. Included areas make up about 10 percent of the total acreage. The moderately deep Twilight soils and the shallow Cabbart soils are on the upper side slopes and on the tops of hills. They are droughty and are low in productivity. The Chinook soils do not adversely affect the use and management of this unit as rangeland and for nonirrigated farming.

The Busby soil is deep and well drained. It formed in alluvium. Typically, the surface layer is grayish brown fine sandy loam 5 inches thick. The subsoil is light olive brown fine sandy loam 6 inches thick. The substratum to a depth of 60 inches or more is mostly light brownish gray fine sandy loam.

Permeability is moderately rapid, and available water capacity is moderate. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 30 inches. Runoff is slow, and the hazard of water erosion is slight to moderate. The hazard of soil blowing is high. This soil is calcareous throughout.

The Yetull soil is deep and somewhat excessively drained. It formed in sandy alluvial and eolian material. Typically, the surface layer is light brownish gray fine sandy loam 6 inches thick. The underlying material to a depth of 60 inches or more is light brownish gray loamy sand.

Permeability is rapid, and available water capacity is low. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 36 inches. Runoff is slow, and the hazard of water erosion is moderate. The hazard of soil blowing is high. This soil is droughty.

Most areas of these soils are used as rangeland. A few areas are used for nonirrigated farming. The main nonirrigated crops are wheat, oats, and barley.

Cropland.—These soils are poorly suited to nonirrigated crops. They are limited mainly by the hazards of soil blowing and water erosion and by the droughtiness of the Yetull soil. Because of droughtiness, successful crop production depends on receiving average or above-average rainfall during the early part of the growing season. Minimum tillage, tall grass barriers, stripcropping, and stubble mulch tillage conserve moisture and reduce soil blowing and water erosion.

Rangeland.—The potential native plant community on the Busby soil is mainly prairie sandreed, little bluestem, big bluestem, and needleandthread. If the range is excessively grazed, the proportion of prairie sandreed, little bluestem, and big bluestem decreases and the proportion of needleandthread, perennial short grasses, threadleaf sedge, perennial forbs, and yucca increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,800 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,200 pounds in years of below-normal precipitation.

The potential native plant community on the Yetull soil is mainly sand bluestem, prairie sandreed, Indian ricegrass, little bluestem, and sun sedge. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, sand dropseed, perennial short grasses, threadleaf sedge, perennial forbs, and yucca increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 2,000 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,000 pounds in years of below-normal precipitation.

The surface layer of these soils is susceptible to water erosion and soil blowing if it is disturbed or the range is overgrazed. Proper grazing use insures good plant vigor and adequate plant cover. Areas of deteriorated rangeland can be improved by mechanical treatment practices such as shallow chiseling.

Windbreaks.—The Busby soil is suited to windbreaks, but the limited moisture supply restricts the choice of trees and shrubs. Suitable trees for planting are Russian-olive, Siberian elm, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, and skunkbush sumac.

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

Homesite development.—These soils are well suited to homesite development. They have few limitations. In places, excavation for roads can expose material that is highly susceptible to soil blowing. Because the Yetull soil is rapidly permeable, effluent from septic tank absorption fields may contaminate ground water.

This map unit is in capability subclass IVe, nonirrigated. The Busby soil is in Sandy range site, 10 to 14-inch precipitation zone, and the Yetull soil is in Sands range site, 10 to 14-inch precipitation zone.

25—Cabba loam, 15 to 25 percent slopes. This shallow, well drained soil is on the sides and tops of hills and ridges in the eastern part of the county. It formed in

material derived from weakly consolidated, sandy and silty sedimentary beds. Slopes are mainly less than 250 feet long. Elevation is 1,900 to 3,400 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Barkof, Dast, and Macar soils. Also included are small areas of sandstone and siltstone outcroppings. These areas do not adversely affect the use and management of this unit as rangeland.

Typically, this Cabba soil has a surface layer of light yellowish brown loam 5 inches thick. The underlying material to a depth of 15 inches is light yellowish brown and pale yellow loam. Below this to a depth of 60 inches or more are pale yellow, weakly consolidated, sandy and silty sedimentary beds. Sedimentary beds are at a depth of 10 to 20 inches.

Permeability is moderate, and available water capacity is very low. Effective rooting depth is limited by the sedimentary beds at a depth of 10 to 20 inches. Where this soil is under native vegetation, the average annual wetting depth is 10 to 20 inches. Runoff is medium, and the hazard of water erosion is high. The hazard of soil blowing is high. The soil is calcareous throughout. It is droughty.

This soil is used as rangeland.

Cropland.—This soil is very poorly suited to cultivated crops because of steepness of slope and the very low available water capacity.

Rangeland.—The potential native plant community is mainly bluebunch wheatgrass, little bluestem, western wheatgrass, plains muhly, and sideoats grama. If the range is excessively grazed, the proportion of these grasses decreases and the proportion of needleandthread, perennial short grasses, threadleaf sedge, and perennial forbs increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,200 pounds per acre of air-dry vegetation in years of above-normal precipitation and 700 pounds in years of below-normal precipitation.

The surface layer is susceptible to water erosion and soil blowing if it is disturbed or the range is overgrazed. Limited use of mechanical treatment practices such as contour furrowing and scalping can improve deteriorated areas of rangeland.

Windbreaks.—This soil is poorly suited to windbreaks. It is limited mainly by the very low available water capacity and the steepness of slope.

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

This map unit is in capability subclass VIe, nonirrigated. It is in Shallow range site, 10- to 14-inch precipitation zone.

26—Cabba-Badland complex, 15 to 45 percent slopes. This map unit is on uplands in the eastern part of the county. Slopes are mainly less than 250 feet long. Elevation is 2,900 to 3,400 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

This unit is about 35 percent Cabba loam and 35 percent Badland. The Cabba soil is on the sides and tops of hills and ridges, and Badland consists of deeply entrenched coulees, escarpments, and terrace edges.

Included in this unit are small areas of Dast, Brandenburg, Macar, and Zahill soils. Included areas make up about 30 percent of the total acreage. These areas do not adversely affect the use and management of this unit as rangeland.

The Cabba soil is shallow and well drained. It formed in material derived from weakly consolidated, sandy and silty sedimentary beds. Typically, the surface layer is light yellowish brown loam 5 inches thick. The underlying material to a depth of 15 inches is light yellowish brown and pale yellow loam. Below this to a depth of 60 inches or more are pale yellow, weakly consolidated silty sedimentary beds. Sedimentary beds are at a depth of 10 to 20 inches.

Permeability is moderate, and available water capacity is very low. Effective rooting depth is limited by the sedimentary beds at a depth of 10 to 20 inches. Where this soil is under native vegetation, the average annual wetting depth is 10 to 20 inches. Runoff is medium, and the hazard of water erosion is high. The hazard of soil blowing is high. This soil is calcareous throughout. It is droughty.

Badland consists mainly of steep to very steep, barren and nearly barren escarpments, narrow ridges, and deeply entrenched coulees. It was formed by active geologic erosion of weakly consolidated, sandy and silty sedimentary beds and semiconsolidated shale.

Runoff is rapid or very rapid, and the hazard of water erosion is very high. The hazard of soil blowing is high.

This unit is used as rangeland.

Cropland.—This unit is not suited to cultivated crops because of steepness of slope and the areas of Badland.

Rangeland.—The potential native plant community on the Cabba soil is mainly bluebunch wheatgrass, little bluestem, western wheatgrass, plains muhly, and sideoats grama. If the range is excessively grazed, the proportion of these grasses decreases and the proportion of needleandthread, perennial short grasses, threadleaf sedge, and perennial forbs increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,200 pounds per acre of air-dry vegetation in years of above-normal precipitation and 700 pounds in years of below-normal precipitation.

Steepness of slope limits access by livestock and promotes overgrazing of the less sloping areas. Trails or walkways can be constructed in places to encourage livestock grazing in areas where access is limited. Use of mechanical treatment practices is not practical.

Windbreaks.—This unit is not suited to windbreaks because of the steepness of slope and the areas of Badland.

Homesite development.—This unit is poorly suited to homesite development because of the steepness of slope.

This map unit is in capability subclass VIIe, nonirrigated. The Cabba soil is in Shallow range site, 10- to 14-inch precipitation zone.

27—Cabba-Barkof complex, 15 to 45 percent slopes. This map unit is on hills and ridges in the east-central and southeastern parts of the county. Slopes are mainly less than 250 feet long. Elevation is 1,900 to 3,400 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

This unit is about 45 percent Cabba loam and 35 percent Barkof silty clay.

Included in this unit are small areas of Dast and Cambert soils and shale outcroppings. Included areas make up about 20 percent of the total acreage. These areas do not adversely affect the use and management of this unit as rangeland.

The Cabba soil is shallow and well drained. It formed in material derived from weakly consolidated, sandy and silty sedimentary beds. Typically, the surface layer is light yellowish brown loam 5 inches thick. The underlying material to a depth of 15 inches is light yellowish brown and pale yellow loam. Below this to a depth of 60 inches or more are pale yellow, weakly consolidated sedimentary beds. Sedimentary beds are at a depth of 10 to 20 inches.

Permeability is moderate, and available water capacity is very low. Effective rooting depth is limited by the sedimentary beds at a depth of 10 to 20 inches. Where this soil is under native vegetation, the average annual wetting depth is 10 to 20 inches. Runoff is medium, and the hazard of water erosion is high. The hazard of soil blowing is high. This soil is calcareous throughout. It is droughty.

The Barkof soil is moderately deep and well drained. It formed in material derived from semiconsolidated shale. Typically, the surface layer, where mixed to a depth of 7 inches, is grayish brown silty clay. The subsoil is mostly light brownish gray silty clay 19 inches thick. The substratum to a depth of 29 inches is light gray silty clay. Below this to a depth of 60 inches or more is mainly white semiconsolidated shale. Semiconsolidated shale is at a depth of 20 to 40 inches.

Permeability is slow, and available water capacity is low. Effective rooting depth is limited by the semiconsolidated shale at a depth of 20 to 40 inches. Where this soil is under native vegetation, the average annual wetting depth is 20 to 24 inches. Runoff is very rapid, and the hazard of water erosion is very high. The hazard of soil blowing is moderate. This soil is calcareous throughout. It is droughty.

These soils are used as rangeland.

Cropland.—These soils are not suited to cultivated crops because of the steepness of slope.

Rangeland.—The potential native plant community on the Cabba soil is mainly bluebunch wheatgrass, little bluestem, western wheatgrass, plains muhly, and sideoats grama. If the range is excessively grazed, the proportion of these grasses decreases and the proportion of needleandthread, perennial short grasses, threadleaf sedge, and perennial forbs increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,200 pounds per acre of air-dry vegetation in years of above-normal precipitation and 700 pounds in years of below-normal precipitation.

The potential native plant community on the Barkof soil is mainly western wheatgrass, green needlegrass, bluebunch wheatgrass, and sideoats grama. If the range is excessively grazed, the proportion of these grasses decreases and the proportion of perennial short grasses, perennial forbs, and big sagebrush increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,300 pounds of air-dry vegetation in years of above-normal precipitation and 850 pounds in years of below-normal precipitation.

Steepness of slope limits access by livestock and promotes overgrazing of the less sloping areas of these soils. Use of mechanical treatment practices is not practical.

Windbreaks.—These soils are not suited to windbreaks. They are limited mainly by the steepness of slope and the low and very low available water capacity.

Homesite development.—These soils are poorly suited to homesite development because of the steepness of slope.

This map unit is in capability subclass VIIe, nonirrigated. The Cabba soil is in Shallow range site, 10- to 14-inch precipitation zone, and the Barkof soil is in Thin Clayey range site, 10- to 14-inch precipitation zone.

28—Cabba-Brandenburg complex, 8 to 45 percent slopes. This map unit is on uplands, mostly in the southeastern part of the county. Slopes are mainly less than 250 feet long. Elevation is 1,900 to 3,400 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

This unit is about 50 percent Cabba loam and 35 percent Brandenburg channery loam. The strongly sloping to moderately steep Cabba soil is on the sides of hills and ridges, and the strongly sloping to steep Brandenburg soil is on the upper side slopes and tops of hills and ridges.

Included in this unit are small areas of Dast, Barkof, and Cambert soils. Included areas make up about 15 percent of the total acreage. These areas do not adversely affect the use and management of this unit as rangeland.

The Cabba soil is shallow and well drained. It formed in material derived from weakly consolidated, sandy and silty sedimentary beds. Typically, the surface layer is light yellowish brown loam 5 inches thick. The underlying material to a depth of 15 inches is light yellowish brown and pale yellow loam. Below this to a depth of 60 inches or more are pale yellow, weakly consolidated sedimentary beds. Sedimentary beds are at a depth of 10 to 20 inches.

Permeability is moderate, and available water capacity is very low. Effective rooting depth is limited by sedimentary beds at a depth of 10 to 20 inches. Where this soil is under native vegetation, the average annual wetting depth is 10 to 20 inches. Runoff is medium, and the hazard of water erosion is high. The hazard of soil blowing is high. This soil is calcareous throughout. It is droughty.

The Brandenburg soil is deep and excessively drained. It formed in material derived from shattered porcellanite. Typically, the surface layer is brown channery loam 5 inches thick. The underlying material to a depth of 10 inches is brown very channery loam. Below this to a depth of 60 inches or more is reddish yellow, shattered porcellanite. Shattered porcellanite is at a depth of 10 to 20 inches.

Permeability is moderate to a depth of 10 inches and very rapid below this depth. Available water capacity is very low. Effective rooting depth is limited by the shattered porcellanite at a depth of 10 to 20 inches. Where this soil is under native vegetation, the average annual wetting depth is about 48 inches. Runoff is medium, and the hazard of water erosion is high. The hazard of soil blowing is moderate. This soil is calcareous throughout. It is droughty.

These soils are used as rangeland.

Cropland.—These soils are not suited to cultivated crops because of droughtiness and steepness of slope.

Rangeland.—The potential native plant community on the Cabba soil is mainly bluebunch wheatgrass, little bluestem, western wheatgrass, plains muhly, sideoats grama, and needleandthread. If the range is excessively grazed, the proportion of bluebunch wheatgrass, little bluestem, western wheatgrass, plains muhly, and sideoats grama decreases and the proportion of needleandthread, perennial short grasses, threadleaf sedge, and perennial forbs increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,200 pounds per acre of air-dry vegetation in years of above-normal precipitation and 700 pounds in years of below-normal precipitation.

The potential native plant community on the Brandenburg soil is mainly prairie sandreed, bluebunch wheatgrass, little bluestem, thickspike wheatgrass, and plains muhly. If the range is excessively grazed, the proportion of these grasses decreases and the proportion of needleandthread, blue grama, threadleaf sedge, and perennial forbs increases. If excessive grazing continues, plants such as red threeawn, annuals, and weedlike forbs may invade. The potential native plant community produces about 725 pounds per acre of air-dry vegetation in years of above-normal precipitation and 425 pounds in years of below-normal precipitation.

Steepness of slope limits access by livestock and promotes overgrazing of the less sloping areas of these soils. Use of mechanical treatment practices is not practical.

Windbreaks.—These soils are poorly suited to windbreaks. They are limited mainly by very low available water capacity.

Homesite development.—Areas of the Cabba soil that have slopes of more than 15 percent are poorly suited to homesite development. Where slopes are less than 15 percent, however, the soil is suited to homesite development. It is limited mainly by low soil strength and the slow permeability of the underlying sedimentary beds. This soil is poorly suited to septic tank absorption fields because of the slow permeability of the underlying sedimentary beds. Low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome this limitation.

The Brandenburg soil is poorly suited to homesite development because of the steepness of slope and the shattered porcellanite below a depth of 10 to 20 inches. If crushed to gravel-sized fragments, the underlying material of the Brandenburg soil can be used in building and surfacing roads.

This map unit is in capability subclass VIIe, nonirrigated. The Cabba soil is in Shallow range site, 10- to 14-inch precipitation zone, and the Brandenburg soil is in Very Shallow range site, 10- to 14-inch precipitation zone.

29—Cabba-Dast complex, 15 to 45 percent slopes. This map unit is on the sides and tops of hills and ridges in the east-central and southeastern parts of the county. Slopes are mainly less than 250 feet long. Elevation is 1,900 to 3,400 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

This unit is about 45 percent Cabba loam and 40 percent Dast fine sandy loam.

Included in this unit are small areas of Barkof, Macar, and Lisk soils and small areas of sandstone outcroppings. Included areas make up about 15 percent of the total acreage. These areas do not adversely affect the use and management of this unit as rangeland.

The Cabba soil is shallow and well drained. It formed in material derived from weakly consolidated, sandy and silty sedimentary beds. Typically, the surface layer is light yellowish brown loam 5 inches thick. The underlying material to a depth of 15 inches is light yellowish brown and pale yellow loam. Below this to a depth of 60 inches or more are pale yellow, weakly consolidated sedimentary beds. Sedimentary beds are at a depth of 10 to 20 inches.

Permeability is moderate, and available water capacity is very low. Effective rooting depth is limited by the sedimentary beds at a depth of 10 to 20 inches. Where this soil is under native vegetation, the average annual wetting depth is 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is high. This soil is calcareous throughout. It is droughty.

The Dast soil is moderately deep and well drained. It formed in material derived from weakly consolidated, sandy sedimentary beds. Typically, the surface layer is brown fine sandy loam 3 inches thick. The underlying material to a depth of 25 inches is light gray and very pale brown fine sandy loam. Below this to a depth of 60 inches or more are pale yellow, weakly consolidated, sandy sedimentary beds. Sedimentary beds are at a depth of 20 to 40 inches.

Permeability is moderately rapid, and available water capacity is low. Effective rooting depth is limited by the sedimentary beds at a depth of 20 to 40 inches. Where this soil is under native vegetation, the average annual wetting depth is 20 to 32 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is high. This soil is calcareous throughout. It is droughty.

These soils are used as rangeland.

Cropland.—These soils are not suited to cultivated crops because of the steepness of slope.

Rangeland.—The potential native plant community on the Cabba soil is mainly bluebunch wheatgrass, little bluestem, western wheatgrass, plains muhly, and sideoats grama. If the range is excessively grazed, the proportion of these grasses decreases and the proportion of needleandthread, perennial short grasses, threadleaf sedge, and perennial forbs increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,200 pounds per acre of air-dry vegetation in years of above-normal precipitation and 700 pounds in years of below-normal precipitation.

The potential native plant community on the Dast soil is mainly prairie sandreed, little bluestem, plains muhly, sideoats grama, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, perennial short grasses, green sagewort, and perennial forbs increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,400 pounds per acre of air-dry vegetation in years of above-normal precipitation and 800 pounds in years of below-normal precipitation.

Steepness of slope limits access by livestock and promotes overgrazing of the less sloping areas of these soils. Use of mechanical treatment practices is not practical.

Windbreaks.—These soils are not suited to windbreaks. They are limited mainly by the steepness of slope.

Homesite development.—These soils are poorly suited to homesite development because of the steepness of slope.

This map unit is in capability subclass VIIe, nonirrigated. The Cabba soil is in Shallow range site, 10- to 14-inch precipitation zone, and the Dast soil is in Thin Sandy range site, 10- to 14-inch precipitation zone.

30—Cabba-Wabek-Dast complex, 15 to 45 percent slopes. This map unit is on hills and ridges in the southeastern part of the county. Slopes are mainly less than 250 feet long. Elevation is 2,500 to 3,400 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

This unit is about 35 percent Cabba loam, 25 percent Wabek sandy loam, and 25 percent Dast fine sandy loam. The moderately steep to steep Cabba and Dast soils are on the sides and foot slopes of hills and ridges, and the moderately steep Wabek soil is on the tops of hills and ridges.

Included in this unit are small areas of Shambo and Cambert soils. Included areas make up about 15 percent of the total acreage. These areas do not adversely affect the use and management of this unit as rangeland.

The Cabba soil is shallow and well drained. It formed in material derived from weakly consolidated sandy and silty sedimentary beds. Typically, the surface layer is light yellowish brown loam 5 inches thick. The underlying material to a depth of 15 inches is light yellowish brown and pale yellow loam. Below this to a depth of 60 inches or more are pale yellow, weakly consolidated, sedimentary beds. Sedimentary beds are at a depth of 10 to 20 inches.

Permeability is moderate, and available water capacity is very low. Effective rooting depth is limited by the sedimentary beds at a depth of 10 to 20 inches. Where this soil is under native vegetation, the average annual wetting depth is 10 to 20 inches. Runoff is rapid, and the

hazard of water erosion is high. The hazard of soil blowing is high. This soil is calcareous throughout. It is droughty.

The Wabek soil is deep and excessively drained. It formed in sandy and gravelly outwash deposits. Typically, the surface layer is grayish brown sandy loam 7 inches thick. The underlying material to a depth of 60 inches or more is light gray very gravelly sand. Very gravelly sand is at a depth of 7 to 15 inches.

Permeability is very rapid, and available water capacity is very low. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 34 inches. Runoff is medium, and the hazard of water erosion is high. The hazard of soil blowing is high. This soil is calcareous below a depth of 7 inches. It is very droughty.

The Dast soil is moderately deep and well drained. It formed in material derived from weakly consolidated, sandy sedimentary beds. Typically, the surface layer is brown fine sandy loam 3 inches thick. The underlying material to a depth of 25 inches is light gray and very pale brown fine sandy loam. Below this to a depth of 60 inches or more are pale yellow, weakly consolidated, sandy sedimentary beds. Sedimentary beds are at a depth of 20 to 40 inches.

Permeability is moderately rapid, and available water capacity is low. Effective rooting depth is limited by the sedimentary beds at a depth of 10 to 20 inches. Where this soil is under native vegetation, the average annual wetting depth is 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is high. This soil is calcareous throughout. It is droughty.

These soils are used as rangeland.

Cropland.—These soils are not suited to cultivated crops because of steepness of slope.

Rangeland.—The potential native plant community on the Cabba soil is mainly bluebunch wheatgrass, little bluestem, western wheatgrass, plains muhly, and sideoats grama. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, perennial short grasses, threadleaf sedge, and perennial forbs increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,200 pounds per acre of air-dry vegetation in years of above-normal precipitation and 700 pounds in years of below-normal precipitation.

The potential native plant community on the Wabek soil is mainly bluebunch wheatgrass, plains muhly, little bluestem, and needleandthread. If the range is excessively grazed, the proportion of bluebunch wheatgrass, plains muhly, and little bluestem decreases and the proportion of needleandthread, threadleaf sedge, blue grama, green sagewort, and yucca increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 700 pounds per acre of air-dry vegetation in years of above-normal precipitation and 400 pounds in years of below-normal precipitation.

The potential native plant community on the Dast soil is mainly prairie sandreed, little bluestem, sideoats grama, and plains muhly. If the range is excessively grazed, the proportion of these grasses decreases and the proportion of needleandthread, perennial short grasses, green sagewort, threadleaf sedge, and perennial forbs increases. If excessive grazing continues, plants such as red threeawn, annuals, and weedlike forbs may invade. The potential native plant community produces about 1,400 pounds per acre of air-dry vegetation in years of above-normal precipitation and 800 pounds in years of below-normal precipitation.

Steepness of slope limits access by livestock and promotes overgrazing of the less sloping areas of these soils. Use of mechanical treatment practices is not practical.

Windbreaks.—These soils are not suited to windbreaks. They are limited mainly by steepness of slope.

Homesite development.—These soils are poorly suited to homesite development because of the steepness of slope. The Wabek soil is a source of gravel for building and surfacing roads.

This map unit is in capability subclass VIIe, nonirrigated. The Cabba soil is in Shallow range site, 10- to 14-inch precipitation zone, the Wabek soil is in Gravel range site, 10- to 14-inch precipitation zone; and the Dast soil is in Thin Sandy range site, 10- to 14-inch precipitation zone.

31—Cabbart silt loam, 15 to 25 percent slopes. This shallow, well drained soil is on the sides and tops of hills and ridges in the west-central and southwestern parts of the county. It formed in material derived from weakly consolidated, sandy and silty sedimentary beds. Slopes are mainly less than 250 feet long. Elevation is 1,900 to 2,600 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Yawdim, Busby, Yamac, and Fleak soils and areas of sandstone and siltstone outcroppings. These areas do not adversely affect the use and management of this unit as rangeland.

Typically, this Cabbart soil has a surface layer of grayish brown silt loam 4 inches thick. The underlying material to a depth of 13 inches is pale olive silt loam. Below this to a depth of 60 inches or more are pale yellow, weakly consolidated, sandy and silty sedimentary beds. Sedimentary beds are at a depth of 10 to 20 inches.

Permeability is moderate, and available water capacity is very low. Effective rooting depth is limited by the sedimentary beds at a depth of 10 to 20 inches. Where this soil is under native vegetation, the average annual wetting depth is 10 to 20 inches. Runoff is medium, and the hazard of water erosion is high. The hazard of soil blowing is high. This soil is calcareous throughout. It is droughty.

This soil is used as rangeland.

Cropland.—This soil is not suited to cultivated crops because of steepness of slope and droughtiness.

Rangeland.—The potential native plant community is mainly bluebunch wheatgrass, little bluestem, western wheatgrass, sideoats grama, and plains muhly. If the range is excessively grazed, the proportion of these grasses decreases and the proportion of needleandthread, perennial short grasses, perennial forbs, and creeping juniper increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,200 pounds per acre of air-dry vegetation in years of above-normal precipitation and 700 pounds in years of below-normal precipitation.

Steepness of slope limits access by livestock and promotes overgrazing of the less sloping areas. Use of mechanical treatment practices is not practical. The soil is not suited to practices such as seeding because it is droughty and is susceptible to soil blowing and water erosion if it is disturbed.

Windbreaks.—This soil is not suited to windbreaks because of the very low available water capacity and the steepness of slope.

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

This map unit is in capability subclass VIIe, nonirrigated. It is in Shallow range site, 10- to 14-inch precipitation zone.

32—Cabbart-Badland complex, 15 to 45 percent slopes. This map unit is on uplands in the west-central and southwestern parts of the county. Slopes are mainly less than 250 feet long. Elevation is 1,900 to 2,600 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

This unit is about 35 percent Cabbart silt loam and about 35 percent Badland. The moderately steep to steep Cabbart soil is on the upper side slopes and tops of hills and ridges. The steep to very steep areas of Badland are narrow ridges, deep coulees, and escarpments.

Included in this unit are small areas of Kirby, Busby, Yamac, Gerdrum, and Yawdim soils and soils that have slopes of less than 15 percent. Included areas make up about 30 percent of the total acreage. These areas do not adversely affect the use and management of this unit as rangeland.

The Cabbart soil is shallow and well drained. It formed in material derived from weakly consolidated, sandy and silty sedimentary beds. Typically, the surface layer is grayish brown silt loam 4 inches thick. The underlying material to a depth of 13 inches is pale olive silt loam. Below this to a depth of 60 inches or more are pale yellow, weakly consolidated, sandy and silty sedimentary beds. Sedimentary beds are at a depth of 10 to 20 inches.

Permeability is moderate, and available water capacity is very low. Effective rooting depth is limited by the sedimentary beds at a depth of 10 to 20 inches. Where this soil is under native vegetation, the average annual wetting depth is 10 to 20 inches. Runoff is medium, and the hazard of water erosion is high. The hazard of soil blowing is high. This soil is calcareous throughout. It is droughty.

Badland consists mainly of steep to very steep, barren and nearly barren escarpments, narrow ridges, and deeply entrenched coulees. It was formed by active geologic erosion of weakly consolidated, sandy and silty sedimentary beds and semiconsolidated shale. Runoff is rapid to very rapid, and the hazard of water erosion is very high. The hazard of soil blowing is high.

This unit is used as rangeland.

Cropland.—This unit is not suited to cultivated crops because of steepness of slope and the large areas of Badland.

Rangeland.—The potential native plant community on the Cabbart soil is mainly bluebunch wheatgrass, little bluestem, western wheatgrass, sideoats grama, and plains muhly. If the range is excessively grazed, the proportion of these grasses decreases and the proportion of needleandthread, perennial short grasses, perennial forbs, and creeping juniper increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,200 pounds per acre of air-dry vegetation in years of above-normal precipitation and 700 pounds in years of below-normal precipitation.

Steepness of slope limits access by livestock and promotes overgrazing of the less sloping areas. Trails or walkways can be constructed in places to encourage livestock grazing in areas where access is limited.

Windbreaks.—This unit is not suited to windbreaks. It is limited mainly by the very low available water capacity and the steepness of slope.

Homesite development.—This unit is poorly suited to homesite development because of the steepness of slope.

This map unit is in capability subclass VIIe, nonirrigated. The Cabbart soil is in Shallow range site, 10- to 14-inch precipitation zone.

33—Cabbart-Kirby complex, 8 to 45 percent slopes. This map unit is on uplands, mainly in the southwestern part of the county. Slopes are mainly less than 250 feet long. Elevation is 1,900 to 2,600 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

This unit is about 50 percent Cabbart silt loam and 35 percent Kirby very channery loam. The strongly sloping to moderately steep Cabbart soil is on the side slopes of hills and ridges, and the strongly sloping to steep Kirby soil is on the upper side slopes and tops of hills and ridges.

Included in this unit are small areas of Gerdrum, Alona, Yamac, and Yawdim soils. Included areas make up about 15 percent of the total acreage. These areas do not adversely affect the use and management of this unit as rangeland.

The Cabbart soil is shallow and well drained. It formed in material derived from weakly consolidated, sandy and silty sedimentary beds. Typically, the surface layer is grayish brown silt loam 4 inches thick. The underlying material to a depth of 13 inches is pale olive silt loam. Below this to a depth of 60 inches or more are pale yellow, weakly consolidated, sandy and silty sedimentary beds. Sedimentary beds are at a depth of 10 to 20 inches.

Permeability is moderate, and available water capacity is very low. Effective rooting depth is limited by the sedimentary beds at a depth of 10 to 20 inches. Where this soil is under native vegetation, the average annual wetting depth is 10 to 20 inches. Runoff is medium, and the hazard of water erosion is high. The hazard of soil blowing is high. This soil is calcareous throughout. It is droughty.

The Kirby soil is deep and well drained. It formed in material derived from sandstone and shale. Typically, the surface layer is light brown very channery loam 5 inches thick. The upper 13 inches of the underlying material is mainly light brown very channery loam, and the lower part to a depth of 60 inches or more is light brown sandstone and shale fragments. Sandstone and shale fragments are at a depth of 10 to 20 inches.

Permeability is rapid, and available water capacity is very low. Effective rooting depth is limited by sandstone and shale fragments at a depth of 10 to 20 inches. Where this soil is under native vegetation, the average annual wetting depth is about 36 inches. Runoff is medium, and the hazard of water erosion is high. The hazard of soil blowing is moderate. This soil is very droughty.

These soils are used as rangeland.

Cropland.—These soils are not suited to cultivated crops because of the droughtiness and steepness of slope.

Rangeland.—The potential native plant community on the Cabbart soil is mainly bluebunch wheatgrass, little bluestem, western wheatgrass, sideoats grama, and plains muhly. If the range is excessively grazed, the proportion of these grasses decreases and the proportion of needleandthread, perennial short grasses, perennial forbs, and creeping juniper increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,200 pounds per acre of air-dry vegetation in years of above-normal precipitation and 700 pounds in years of below-normal precipitation.

The potential native plant community on the Kirby soil is mainly bluebunch wheatgrass, little bluestem, sideoats grama, plains muhly, and thickspike wheatgrass. If the range is excessively grazed, the proportion of these grasses decreases and the proportion of needleandthread, perennial short grasses, perennial forbs, skunkbush sumac, and creeping juniper increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 700 pounds per acre of air-dry vegetation in years of above-normal precipitation and 400 pounds in years of below-normal precipitation.

Steepness of slope limits access by livestock and promotes overgrazing of the less sloping areas of these soils. Trails or walkways can be constructed in places to encourage livestock grazing in areas where access is limited.

Windbreaks.—These soils are not suited to windbreaks because of the very low available water capacity and the steepness of slope.

Homesite development.—Where slopes are more than 15 percent, the Cabbart soil is poorly suited to homesite development. Where slopes are less than 15 percent, however, the soil is suited to homesite development. It is limited mainly by low soil strength and the slow permeability of the underlying sedimentary beds. The soil is poorly suited to septic tank absorption fields because of the slow permeability of the underlying sedimentary beds. Low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome this limitation.

The Kirby soil is poorly suited to homesite development because of the steepness of slope and the high content of sandstone and shale fragments below a depth of 10 to 20 inches. When crushed to gravel-sized fragments, the underlying material of the Kirby soil is suitable for use in building and surfacing roads.

This map unit is in capability subclass VIIe, nonirrigated. The Cabbart soil is in Shallow range site, 10- to 14-inch precipitation zone, and the Kirby soil is in Very Shallow range site, 10- to 14-inch precipitation zone.

34—Cabbart-Twilight complex, 15 to 45 percent slopes. This map unit is on the sides and tops of hills and ridges in the western part of the county. Slopes are

mainly less than 250 feet long. Elevation is 1,900 to 2,600 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

This unit is about 40 percent Cabbart silt loam that has slopes of 15 to 45 percent and about 35 percent Twilight fine sandy loam that has slopes of 15 to 25 percent.

Included in this unit are small areas of Fleak, Yawdim, Busby, and Yamac soils and Rock outcrop. Included areas make up about 25 percent of the total acreage. These soils do not adversely affect the use and management of this unit as rangeland. The areas of Rock outcrop limit the range production of the unit.

The Cabbart soil is shallow and well drained. It formed in material derived from weakly consolidated, sandy and silty sedimentary beds. Typically, the surface layer is grayish brown silt loam 4 inches thick. The underlying material to a depth of 13 inches is pale olive silt loam. Below this to a depth of 60 inches or more are pale yellow, weakly consolidated, sandy and silty sedimentary beds. Sedimentary beds are at a depth of 10 to 20 inches.

Permeability is moderate, and available water capacity is very low. Effective rooting depth is limited by the sedimentary beds at a depth of 10 to 20 inches. Where this soil is under native vegetation, the average annual wetting depth is 10 to 20 inches. Runoff is medium, and the hazard of water erosion is high. This soil is calcareous throughout. It is droughty.

The Twilight soil is moderately deep and well drained. It formed in material derived from weakly consolidated, sandy sedimentary beds. Typically, the surface layer is brown fine sandy loam 5 inches thick. The upper 5 inches of the subsoil is brown fine sandy loam, and the lower 6 inches is pale brown fine sandy loam. The substratum to a depth of 25 inches is light brownish gray sandy loam. Below this to a depth of 60 inches or more are light brownish gray, weakly consolidated, sandy sedimentary beds. Sedimentary beds are at a depth of 20 to 40 inches.

Permeability is moderately rapid, and available water capacity is low. Effective rooting depth is limited by the sedimentary beds at a depth of 20 to 40 inches. Where this soil is under native vegetation, the average annual wetting depth is 20 to 30 inches. Runoff is medium, and the hazard of water erosion is high. The hazard of soil blowing is high. This soil is droughty.

These soils are used as rangeland.

Cropland.—These soils are not suited to cultivated crops because of the droughtiness and steepness of slope.

Rangeland.—The potential native plant community on the Cabbart soil is mainly bluebunch wheatgrass, little bluestem, western wheatgrass, sideoats grama, and plains muhly. If the range is excessively grazed, the proportion of these grasses decreases and the proportion of needleandthread, perennial short grasses, perennial forbs, and creeping juniper increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,200 pounds per acre of air-dry vegetation in years of above-normal precipitation and 700 pounds in years of below-normal precipitation.

The potential native plant community on the Twilight soil is mainly prairie sandreed, little bluestem, plains muhly, and sideoats grama. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, perennial short grasses, green sagewort, and perennial forbs increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,400 pounds per acre of air-dry vegetation in years of above-normal precipitation and 800 pounds in years of below-normal precipitation.

Steepness of slope limits access by livestock and promotes overgrazing of the less sloping areas of these soils. The surface layer is susceptible to water erosion and soil blowing if it is disturbed or the range is overgrazed. Proper grazing use insures good plant vigor and adequate plant cover. Use of mechanical treatment practices is not practical. These soils are not suited to seeding because of the steepness of slope.

Windbreaks.—These soils are not suited to windbreaks because of the very low and low available water capacity and steepness of slope.

Homesite development.—These soils are poorly suited to homesite development because of the steepness of slope.

This map unit is in capability subclass VIIe, nonirrigated. The Cabbart soil is in Shallow range site, 10- to 14-inch precipitation zone, and the Twilight soil is in Thin Sandy range site, 10- to 14-inch precipitation zone.

35—Cabbart-Yawdim complex, 4 to 15 percent slopes. This map unit is on the sides and tops of hills and ridges in the west-central part of the county. Slopes are mainly less than 1,000 feet long. Elevation is 1,900 to 2,600 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

This unit is about 55 percent Cabbart silt loam and 35 percent Yawdim silty clay.

Included in this unit are small areas of Yamac, Cambeth, and Twilight soils and soils that have slopes of less than 4 percent. Included areas make up about 10 percent of the total acreage. These areas do not adversely affect the use and management of this unit as rangeland.

The Cabbart soil is shallow and well drained. It formed in material derived from weakly consolidated, sandy and

silty sedimentary beds. Typically, the surface layer is grayish brown silt loam 4 inches thick. The underlying material to a depth of 13 inches is pale olive silt loam. Below this to a depth of 60 inches or more are pale yellow, weakly consolidated, sandy and silty sedimentary beds. Sedimentary beds are at a depth of 10 to 20 inches.

Permeability is moderate, and available water capacity is very low. Effective rooting depth is limited by the sedimentary beds at a depth of 10 to 20 inches. Where this soil is under native vegetation, the average annual wetting depth is 10 to 20 inches. Runoff is medium, and the hazard of water erosion is high. The hazard of soil blowing is high. This soil is calcareous throughout. It is droughty.

The Yawdim soil is shallow and well drained. It formed in material derived from semiconsolidated shale. Typically, the surface layer is grayish brown silty clay 6 inches thick. The underlying material to a depth of 15 inches is light olive gray silty clay. Below this to a depth of 60 inches or more is light olive gray, semiconsolidated shale. Semiconsolidated shale is at a depth of 10 to 20 inches.

Permeability is slow, and available water capacity is very low. Effective rooting depth is limited by the semiconsolidated shale at a depth of 10 to 20 inches. Where this soil is under native vegetation, the average annual wetting depth is 10 to 20 inches. Runoff is medium to rapid, and the hazard of water erosion is moderate. The hazard of soil blowing is high. This soil is droughty.

These soils are used as rangeland.

Cropland.—These soils are poorly suited to cultivated crops because they are droughty and are underlain by root-limiting material.

Rangeland.—The potential native plant community on the Cabbart soil is mainly bluebunch wheatgrass, little bluestem, western wheatgrass, sideoats grama, and plains muhly. If the range is excessively grazed, the proportion of these grasses decreases and the proportion of needleandthread, perennial short grasses, perennial forbs, and creeping juniper increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,200 pounds per acre of air-dry vegetation in years of above-normal precipitation and 700 pounds in years of below-normal precipitation.

The potential native plant community on the Yawdim soil is mainly western wheatgrass, green needlegrass, thickspike wheatgrass, and Nuttall saltbush. If the range is excessively grazed, the proportion of these plants decreases and the proportion of Sandberg bluegrass, blue grama, big sagebrush, perennial forbs, and rabbitbrush increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,000 pounds per acre of air-dry vegetation in years of above-normal precipitation and 600 pounds in years of below-normal precipitation.

The surface layer of these soils is susceptible to water erosion and soil blowing if it is disturbed or the range is overgrazed. Rangeland seeding of native plants is a suitable practice to convert land to rangeland from other uses. Limited use of mechanical treatment practices such as contour furrowing and scalping can improve deteriorated areas of rangeland.

Windbreaks.—These soils are not suited to windbreaks because of their very low available water capacity.

Homesite development.—These soils are poorly suited to homesite development. The Cabbart soil is limited mainly by slow permeability of the underlying sedimentary beds, low soil strength, and shrink-swell potential. In the construction of basements or foundations for dwellings, the limitation of shrink-swell potential can be overcome by backfilling with suitable material that has low shrink-swell potential. This soil is poorly suited to septic tank absorption fields because of the slow permeability of the underlying sedimentary beds. Shrinking and swelling and low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations.

The Yawdim soil is limited for use as homesites mainly by shallow depth to semiconsolidated shale, shrink-swell potential, low soil strength, and slow permeability. In the construction of basements or foundations for dwellings, the limitation of shrink-swell potential can be overcome by backfilling with suitable material that has low shrink-swell potential. This soil is poorly suited to septic tank absorption fields because of the slow permeability and shallow depth to semiconsolidated shale. Shrinking and swelling, low soil strength, and shallow depth to semiconsolidated shale can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations.

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

36—Cabbart-Yawdim complex, 15 to 45 percent slopes. This map unit is on the sides and tops of ridges and hills in the west-central part of the county. Slopes are mainly less than 250 feet long. Elevation is 1,900 to 2,600 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

This unit is about 45 percent Cabbart silt loam and about 35 percent Yawdim silty clay.

Included in this unit are small areas of Fleak, Yamac, and Gerdrum soils and shale outcroppings. Included areas make up about 20 percent of the total acreage. These areas do not adversely affect the use and management of this unit as rangeland.

The Cabbart soil is shallow and well drained. It formed in material derived from weakly consolidated, sandy and silty sedimentary beds. Typically, the surface layer is grayish brown silt loam 4 inches thick. The underlying material to a depth of 13 inches is pale olive silt loam. Below this to a depth of 60 inches or more are pale yellow, weakly consolidated, sandy and silty sedimentary beds. Sedimentary beds are at a depth of 10 to 20 inches.

Permeability is moderate, and available water capacity is very low. Effective rooting depth is limited by the sedimentary beds at a depth of 10 to 20 inches. Where this soil is under native vegetation, the average annual wetting depth is 10 to 20 inches. Runoff is medium, and the hazard of water erosion is high. The hazard of soil blowing is high. This soil is calcareous throughout. It is droughty.

The Yawdim soil is shallow and well drained. It formed in material derived from semiconsolidated shale. Typically, the surface layer is grayish brown silty clay 6 inches thick. The underlying material to a depth of 15 inches is light olive gray silty clay. Below this to a depth of 60 inches or more is light olive gray semiconsolidated shale. Semiconsolidated shale is at a depth of 10 to 20 inches.

Permeability is slow, and available water capacity is very low. Effective rooting depth is limited by the semiconsolidated shale at a depth of 10 to 20 inches. Where this soil is under native vegetation, the average annual wetting depth is 10 to 20 inches. Runoff is very rapid, and the hazard of water erosion is high. The hazard of soil blowing is high. This soil is droughty.

These soils are used as rangeland.

Cropland.—These soils are not suited to cultivated crops because of the steepness of slope.

Rangeland.—The potential native plant community on the Cabbart soil is mainly bluebunch wheatgrass, little bluestem, western wheatgrass, sideoats grama, and plains muhly. If the range is excessively grazed, the proportion of these grasses decreases and the proportion of needleandthread, perennial short grasses, perennial forbs, and creeping juniper increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,200 pounds per acre of air-dry vegetation in years of above-normal precipitation and 700 pounds in years of below-normal precipitation.

The potential native plant community on the Yawdim soil is mainly western wheatgrass, green needlegrass, thickspike wheatgrass, and Nuttall saltbush. If the range is excessively grazed, the proportion of these plants decreases and the proportion of Sandberg bluegrass, blue grama, big sagebrush, perennial forbs, and rabbitbrush increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,000 pounds per acre of air-dry vegetation in years of above-normal precipitation and 600 pounds in years of below-normal precipitation.

Steepness of slope limits access by livestock and promotes overgrazing of the less sloping areas of these soils. Use of mechanical treatment practices is not practical. These soils are not suited to rangeland seeding because of the steepness of slope.

Windbreaks.—These soils are not suited to windbreaks because of the steepness of slope and the very low available water capacity.

Homesite development.—These soils are poorly suited to homesite development because of the steepness of slope and the shallow depth to semiconsolidated shale in the Yawdim soil.

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

37—Cambert loam, 2 to 8 percent slopes. This moderately deep, well drained soil is on the sides and tops of knolls and low hills in the eastern part of the county. It formed in material derived from weakly consolidated, silty sedimentary beds. Slopes are mainly 250 to 1,000 feet long. Elevation is 1,900 to 3,400 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Lisk, Dast, Barkof, Bryant, and Zahill soils. The Lisk, Dast, and Zahill soils are highly susceptible to soil blowing. The Dast and Barkof soils are droughty and thus are low in productivity. The Lisk soils are on fans and foot slopes, and the Dast, Barkof, and Zahill soils are on the upper side slopes and on the tops of knolls and low hills. The Bryant soils do not adversely affect the use and management of this unit for nonirrigated farming or as rangeland.

Typically, this Cambert soil has a surface layer of brown loam 4 inches thick. The subsoil is mostly brown loam 9 inches thick. The substratum to a depth of 26 inches is very pale brown silty clay loam. Below this to a depth of 60 inches or more are pale yellow and light gray, weakly consolidated, silty sedimentary beds. Sedimentary beds are at a depth of 20 to 40 inches.

Permeability is moderate, and available water capacity is moderate. Effective rooting depth is limited by the sedimentary beds at a depth of 20 to 40 inches. Where this soil is under native vegetation, the average annual wetting depth is 20 to 30 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of

soil blowing is moderate. This soil is calcareous below a depth of 9 inches.

This soil is used as rangeland and for nonirrigated crops. The main nonirrigated crops are wheat, oats, and barley.

Cropland.—This soil is well suited to nonirrigated crops. It is limited mainly by the moderate hazards of soil blowing and water erosion and moderate available water capacity. Minimum tillage, contour cultivation, grassed waterways, and stripcropping reduce soil blowing and water erosion. Organic matter content and availability of moisture in the surface layer can be increased by stubble mulch tillage.

Rangeland.—The potential native plant community is mainly western wheatgrass, green needlegrass, little bluestem, bluebunch wheatgrass, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, perennial short grasses, threadleaf sedge, fringed sagewort, and perennial forbs increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,600 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,000 pounds in years of below-normal precipitation.

The surface layer is susceptible to water erosion and soil blowing if it is disturbed or the range is overgrazed. Proper grazing use insures good plant vigor and adequate plant cover. Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Areas of deteriorated rangeland can be improved by mechanical treatment practices such as shallow chiseling and scalping.

Windbreaks.—This soil is suited to windbreaks, but the limited moisture supply restricts the choice of trees and shrubs. Suitable trees for planting are Russian-olive, Siberian elm, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, and skunkbush sumac.

Homesite development.—This soil is poorly suited to homesite development. It is limited mainly by low soil strength and the slow permeability of the underlying sedimentary beds. Low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome this limitation. This soil is poorly suited to septic tank absorption fields because of the slow permeability of the underlying sedimentary beds.

This map unit is in capability subclass IIIe, nonirrigated. It is in Silty range site, 10- to 14-inch precipitation zone.

38—Cambert-Barkof-Cabba complex, 4 to 15 percent slopes. This map unit is on uplands, mainly in the east-central and southeastern parts of the county. Slopes are mainly less than 1,000 feet long. Elevation is 1,900 to 3,400 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

This unit is about 40 percent Cambert loam, 25 percent Barkof silty clay, and 25 percent Cabba loam. The Cambert and Barkof soils are on foot slopes and side slopes of hills and ridges, and the Cabba soil is on the tops of hills and ridges.

Included in this unit are small areas of Bryant and Dast soils. Also included are small areas of soils that have slopes of less than 4 percent. Included areas make up about 10 percent of the total acreage. The moderately deep Dast soils are highly susceptible to soil blowing. They are on the upper side slopes and tops of hills and ridges. The Bryant soils do not adversely affect the use and management of this unit as rangeland and for nonirrigated farming.

The Cambert soil is moderately deep and well drained. It formed in material derived from weakly consolidated, silty sedimentary beds. Typically, the surface layer is brown loam 4 inches thick. The subsoil is mostly brown loam 9 inches thick. The substratum to a depth of 26 inches is very pale brown silty clay loam. Below this to a depth of 60 inches or more is pale yellow and light gray, weakly consolidated, silty sedimentary beds. Sedimentary beds are at a depth of 20 to 40 inches.

Permeability is moderate, and available water capacity is moderate. Effective rooting depth is limited by the sedimentary beds at a depth of 20 to 40 inches. Where this soil is under native vegetation, the average annual wetting depth is 20 to 30 inches. Runoff is medium, and the hazard of water erosion is high. The hazard of soil blowing is moderate. This soil is calcareous below a depth of 9 inches.

The Barkof soil is moderately deep and well drained. It formed in material derived from semiconsolidated shale. Typically, the surface layer, where mixed to a depth of 7 inches, is grayish brown silty clay. The subsoil is mostly light brownish gray silty clay 19 inches thick. The substratum to a depth of 29 inches is light gray silty clay. Below this to a depth of 60 inches or more is mainly white semiconsolidated shale. Semiconsolidated shale is at a depth of 20 to 40 inches.

Permeability is slow, and available water capacity is low. Effective rooting depth is limited by the semiconsolidated shale at a depth of 20 to 40 inches. Where this soil is under native vegetation, the average annual wetting depth is 20 to 24 inches. Runoff is slow to medium, and the hazard of water erosion is slight to moderate. The hazard of soil blowing is moderate. This soil is calcareous throughout. It is droughty.

The Cabba soil is shallow and well drained. It formed in material derived from weakly consolidated, sandy and silty sedimentary beds. Typically, the surface layer is light yellowish brown loam 5 inches thick. The underlying material to a depth of 15 inches is light yellowish brown and pale yellow loam. Below this to a depth of 60 inches

or more are pale yellow, weakly consolidated, sandy and silty sedimentary beds. Sedimentary beds are at a depth of 10 to 20 inches.

Permeability is moderate, and available water capacity is very low. Effective rooting depth is limited by the sedimentary beds at a depth of 10 to 20 inches. Where this soil is under native vegetation, the average annual wetting depth is 10 to 20 inches. Runoff is medium, and the hazard of water erosion is high. The hazard of soil blowing is high. This soil is calcareous throughout. It is droughty.

These soils are used as rangeland and for nonirrigated crops. The main nonirrigated crops are wheat, oats, and barley.

Cropland.—These soils are suited to nonirrigated crops. They are limited mainly by the hazards of soil blowing and water erosion, the low and very low available water capacity of the Barkof and Cabba soils, and the limited rooting depth of the Cabba soil. The surface layer of these soils is low in content of organic matter. The Cambert and Cabba soils are high in content of lime. Crops respond well to the application of phosphorus and nitrogen. Using green manure crops, barnyard manure, and crop residue increases the organic matter content and fertility of these soils. Subsoiling the Cabba soil increases the effective rooting depth. Minimum tillage, contour cultivation, stripcropping, tall grass barriers, grassed waterways, and return of crop residue to the soil reduce soil blowing and water erosion. Tall grass barriers also reduce evaporation and trap snow, which increases the amount of moisture in the soil. Return of crop residue also helps to maintain good soil tilth. Chiseling stubble fields in fall on the contour or across the slope reduces runoff and water erosion.

Rangeland.—The potential native plant community on the Cambert soil is mainly western wheatgrass, green needlegrass, little bluestem, bluebunch wheatgrass, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, perennial short grasses, threadleaf sedge, fringed sagewort, and perennial forbs increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,600 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,000 pounds in years of below-normal precipitation.

The potential native plant community on the Barkof soil is mainly western wheatgrass, green needlegrass, thickspike wheatgrass, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of Sandberg bluegrass, blue grama, big sagebrush, and perennial forbs increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,800 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,000 pounds in years of below-normal precipitation.

The potential native plant community on the Cabba soil is mainly bluebunch wheatgrass, little bluestem, western wheatgrass, plains muhly, and needleandthread. If the range is excessively grazed, the proportion of bluebunch wheatgrass, western wheatgrass, little bluestem, and plains muhly decreases and the proportion of needleandthread, perennial short grasses, threadleaf sedge, and perennial forbs increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,200 pounds per acre of air-dry vegetation in years of above-normal precipitation and 700 pounds in years of below-normal precipitation.

The surface layer of these soils is susceptible to water erosion and soil blowing if it is disturbed or the range is overgrazed. Proper grazing use insures good plant vigor and adequate plant cover. Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Areas of deteriorated rangeland can be improved by mechanical treatment practices such as shallow chiseling and scalping. Conducting fieldwork on the contour or across the slope, where practical, reduces erosion and conserves moisture.

Windbreaks.—The Cambert soil is suited to windbreaks, but the limited moisture supply restricts the choice of trees and shrubs. Suitable trees for planting are Russian-olive, Siberian elm, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, and skunkbush sumac.

The Barkof and Cabba soils are poorly suited to windbreaks. The low and very low available water capacity of these soils limits the growth of both trees and shrubs. Suitable trees for planting are Russian-olive, Siberian elm, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, western sandcherry, and skunkbush sumac.

Homesite development.—These soils are poorly suited to homesite development. The Cambert and Cabba soils are limited mainly by low soil strength and slow permeability of the underlying sedimentary beds. The Barkof soil is limited mainly by slow permeability, low soil strength, potential for shrinking and swelling, and moderate depth to semiconsolidated shale. These soils are poorly suited to septic tank absorption fields because of the slow permeability of the underlying sedimentary beds in the Cambert and Cabba soils and the moderate depth to semiconsolidated shale in the Barkof soil. Buildings can be designed to offset the effects of shrinking and swelling. Shrinking and swelling and low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In places, excavation for roads can expose material that is highly susceptible to soil blowing.

This map unit is in capability subclass IVe, nonirrigated. The Cambert soil is in Silty range site, 10- to 14-inch precipitation zone; the Barkof soil is in Clayey range site, 10- to 14-inch precipitation zone; and the Cabba soil is in Shallow range site, 10 to 14-inch precipitation zone.

39—Cambert-Cabba loams, 8 to 15 percent slopes. This map unit is on uplands in the eastern part of the county. Slopes are mainly 250 to 1,000 feet long. Elevation is 1,900 to 3,400 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

This unit is about 50 percent Cambert loam and 35 percent Cabba loam. The Cambert soil is on the side slopes and foot slopes of hills and ridges, and the Cabba soil is on the upper side slopes and tops of hills and ridges.

Included in this unit are small areas of Barkof, Dast, Bryant, and Lisk soils. Included areas make up about 15 percent of the total acreage. The Dast and Barkof soils are on the sides and tops of hills. These soils are droughty, are low in productivity, and are highly susceptible to soil blowing. The Lisk soils are on fans and foot slopes. They are highly susceptible to soil blowing. The Bryant soils do not adversely affect the use and management of this unit as rangeland and for nonirrigated crops.

The Cambert soil is moderately deep and well drained. It formed in material derived from weakly consolidated, silty sedimentary beds. Typically, the surface layer is brown loam 4 inches thick. The subsoil is mostly brown loam 9 inches thick. The substratum to a depth of 26 inches is very pale brown silty clay loam. Below this to a depth of 60 inches or more are pale yellow and light gray, weakly consolidated, silty sedimentary beds. Sedimentary beds are at a depth of 20 to 40 inches.

Permeability is moderate, and available water capacity is moderate. Effective rooting depth is limited by sedimentary beds at a depth of 20 to 40 inches. Where this soil is under native vegetation, the average annual wetting depth is 20 to 30 inches. Runoff is medium, and the hazard of water erosion is high. The hazard of soil blowing is moderate. This soil is calcareous below a depth of 9 inches.

The Cabba soil is shallow and well drained. It formed in material derived from weakly consolidated, sandy and silty sedimentary beds. Typically, the surface layer is light yellowish brown loam 5 inches thick. The underlying material to a depth of 15 inches is light yellowish brown and pale yellow loam. Below this to a depth of 60 inches or more are pale yellow, weakly consolidated, sandy and silty sedimentary beds. Sedimentary beds are at a depth of 10 to 20 inches.

Permeability is moderate, and available water capacity is very low. Effective rooting depth is limited by the sedimentary beds at a depth of 10 to 20 inches. Where this soil is under native vegetation, the average annual wetting depth is 10 to 20 inches. Runoff is medium, and the hazard of water erosion is high. The hazard of soil blowing is high. This soil is calcareous throughout. It is droughty.

These soils are used as rangeland and for nonirrigated crops. The main nonirrigated crops are wheat, oats, and barley.

Cropland.—These soils are suited to nonirrigated crops. They are limited mainly by droughtiness, the shallow depth to weakly consolidated sedimentary beds, and the limited rooting depth of the Cabba soil and by the hazards of soil blowing and water erosion. The surface layer of these soils is high in content of lime and low in content of organic matter. Crops respond well to the application of phosphorus and nitrogen. Using green manure crops, barnyard manure, and crop residue increases the organic matter content and fertility. Subsoiling the Cabba soil increases the effective rooting depth. Minimum tillage, contour cultivation, stripcropping, tall grass barriers, grassed waterways, and return of crop residue to the soil reduce soil blowing and water erosion. Tall grass barriers also reduce evaporation and trap snow, which increases the amount of moisture in the soil. Return of crop residue also helps to maintain good soil tilth. Chiseling stubble fields in fall on the contour or across the slope reduces runoff and water erosion.

Rangeland.—The potential native plant community on the Cambert soil is mainly western wheatgrass, green needlegrass, little bluestem, bluebunch wheatgrass, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, perennial short grasses, threadleaf sedge, fringed sagewort, and perennial forbs increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,600 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,000 pounds in years of below-normal precipitation.

The potential native plant community on the Cabba soil is mainly bluebunch wheatgrass, little bluestem, western wheatgrass, plains muhly, and needleandthread. If the range is excessively grazed, the proportion of bluebunch wheatgrass, western wheatgrass, and plains muhly decreases and the proportion of needleandthread, perennial short grasses, threadleaf sedge, and perennial forbs increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,200 pounds per acre of air-dry vegetation in years of above-normal precipitation and 700 pounds in years of below-normal precipitation.

The surface layer is susceptible to water erosion and soil blowing if it is disturbed or the range is overgrazed. Proper grazing use insures good plant vigor and

adequate plant cover. Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Areas of deteriorated rangeland can be improved by mechanical practices such as shallow chiseling and scalping. Conducting fieldwork on the contour or across the slope, where practical, reduces erosion and conserves moisture.

Windbreaks.—The Cambert soil is suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian elm, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, and skunkbush sumac.

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

Homesite development.—These soils are poorly suited to homesite development. They are limited mainly by the slow permeability of the underlying sedimentary beds and low soil strength. These soils are poorly suited to septic tank absorption fields because of the slow permeability of the underlying sedimentary beds. Low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome this limitation.

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

40—Cambert-Dast-Cabba complex, 4 to 15 percent slopes. This map unit is on uplands in the eastern part of the county. Slopes are mainly less than 1,000 feet long. Elevation is 1,900 to 3,400 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

This unit is about 30 percent Cambert loam, 25 percent Dast fine sandy loam, and 25 percent Cabba loam. The Cambert and Dast soils are on side slopes and foot slopes of hills and ridges, and the Cabba soil is on the tops of hills and ridges.

Included in this unit are small areas of Barkof, Lisk, and Macar soils. Also included are small areas of soils that have slopes of less than 4 percent. Included areas make up about 20 percent of the total acreage. The Lisk and Macar soils are on fans and lower side slopes. They are highly susceptible to soil blowing. The Barkof soils do not adversely affect the use and management of this unit as rangeland and for nonirrigated farming.

The Cambert soil is moderately deep and well drained. It formed in material derived from weakly consolidated, silty sedimentary beds. Typically, the surface layer is brown loam 4 inches thick. The subsoil is mostly brown loam 9 inches thick. The substratum to a depth of 26 inches is very pale brown silty clay loam. Below this to a depth of 60 inches or more are pale yellow and light gray, weakly consolidated, silty sedimentary beds. Sedimentary beds are at a depth of 20 to 40 inches.

Permeability is moderate, and available water capacity is moderate. Effective rooting depth is limited by the sedimentary beds at a depth of 20 to 40 inches. Where this soil is under native vegetation, the average annual wetting depth is 20 to 30 inches. Runoff is medium, and the hazard of water erosion is high. The hazard of soil blowing is moderate. This soil is calcareous below a depth of 9 inches.

The Dast soil is moderately deep and well drained. It formed in material derived from weakly consolidated, sandy sedimentary beds. Typically, the surface layer is brown fine sandy loam 3 inches thick. The underlying material to a depth of 25 inches is brown very pale brown and light gray fine sandy loam. Below this to a depth of 60 inches or more are pale yellow, weakly consolidated, sandy sedimentary beds. Sedimentary beds are at a depth of 20 to 40 inches.

Permeability is moderately rapid, and available water capacity is low. Effective rooting depth is limited by the sedimentary beds at a depth of 20 to 40 inches. Where this soil is under native vegetation, the average annual wetting depth is 20 to 36 inches. Runoff is slow to medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high. This soil is calcareous throughout. It is droughty.

The Cabba soil is shallow and well drained. It formed in material derived from weakly consolidated, sandy and silty sedimentary beds. Typically, the surface layer is light yellowish brown and pale yellow loam 5 inches thick. The underlying material to a depth of 15 inches is light yellowish brown loam. Below this to a depth of 60 inches or more are pale yellow, weakly consolidated, silty sedimentary beds. Sedimentary beds are at a depth of 10 to 20 inches.

Permeability is moderate, and available water capacity is very low. Effective rooting depth is limited by the sedimentary beds at a depth of 10 to 20 inches. Where this soil is under native vegetation, the average annual wetting depth is 10 to 20 inches. Runoff is medium, and the hazard of water erosion is high. The hazard of soil blowing is high. This soil is calcareous throughout. It is droughty.

These soils are used as rangeland and for nonirrigated crops. The main nonirrigated crops are wheat, oats, and barley.

Cropland.—These soils are suited to nonirrigated crops. They are limited mainly by the hazards of soil blowing and water erosion, the low and very low available water capacity of the Dast and Cabba soils, and the limited rooting depth of the Cabba soil. The surface layer of these soils is low in content of organic matter and high in content of lime. Crops respond well to

the application of phosphorus and nitrogen. Using green manure crops, barnyard manure, and crop residue increases the organic matter content and fertility. Subsoiling the Cabba soil increases the effective rooting depth. Minimum tillage, contour cultivation, stripcropping, tall grass barriers, grassed waterways, and return of crop residue to the soil reduce soil blowing and water erosion. Tall grass barriers also reduce evaporation and trap snow, which increases the amount of moisture in the soil. Return of crop residue also helps to maintain good soil tilth. Chiseling stubble fields in fall on the contour or across the slope reduces runoff and water erosion.

Rangeland.—The potential native plant community on the Cambert soil is mainly western wheatgrass, green needlegrass, little bluestem, bluebunch wheatgrass, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, perennial short grasses, threadleaf sedge, fringed sagewort, and perennial forbs increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,600 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,000 pounds in years of below-normal precipitation.

The potential native plant community on the Dast soil is mainly prairie sandreed, little bluestem, needleandthread, and thickspike wheatgrass. If the range is excessively grazed, the proportion of prairie sandreed and little bluestem decreases and the proportion of needleandthread, thickspike wheatgrass, perennial short grasses, threadleaf sedge, perennial forbs, and yucca increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,800 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,000 pounds in years of below-normal precipitation.

The potential native plant community on the Cabba soil is mainly bluebunch wheatgrass, little bluestem, western wheatgrass, plains muhly, and needleandthread. If the range is excessively grazed, the proportion of bluebunch wheatgrass, western wheatgrass, little bluestem, and plains muhly decreases and the proportion of needleandthread, perennial short grasses, threadleaf sedge, and perennial forbs increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade The potential native plant community produces about 1,200 pounds per acre of air-dry vegetation in years of above-normal precipitation and 700 pounds in years of below-normal precipitation.

The surface layer of these soils is susceptible to water erosion and soil blowing if it is disturbed or the range is overgrazed. Proper grazing use insures good plant vigor and adequate plant cover. Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Areas of deteriorated rangeland can be improved by mechanical treatment practices such as shallow chiseling and scalping. Conducting fieldwork on the contour or across the slope, where practical, reduces erosion and conserves moisture.

Windbreaks.—The Cambert soil is suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian elm, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, and skunkbush sumac.

The Dast and Cabba soils are poorly suited to windbreaks. The low and very low available water capacity of these soils limits the growth of both trees and shrubs. Suitable trees for planting are Russian-olive, Siberian elm, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, western sandcherry, and skunkbush sumac.

Homesite development.—The Cambert and Cabba soils are poorly suited to homesite development. They are limited mainly by low soil strength and the slow permeability of the underlying sedimentary beds. These soils are poorly suited to septic tank absorption fields because of the slow permeability of the underlying sedimentary beds. Low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome this limitation. In places, excavation for roads can expose material that is highly susceptible to soil blowing.

The Dast soil is suited to homesite development. It has few limitations. In places, excavation for roads can expose material that is highly susceptible to soil blowing.

This map unit is in capability subclass IVe, nonirrigated. The Cambert soil is in Silty range site, 10- to 14-inch precipitation zone; the Dast soil is in Sandy range site, 10- to 14-inch precipitation zone; and the Cabba soil is in Shallow range site, 10- to 14-inch precipitation zone.

41—Cambeth silt loam, 2 to 8 percent slopes. This moderately deep, well drained soil is on the sides and tops of low hills in the west-central and southwestern parts of the county. It formed in material derived from weakly consolidated, silty sedimentary beds. Slopes are mainly 250 to 1,000 feet long. Elevation is 1,900 to 2,600 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Floweree, Lonna, Busby, and Yawdim soils. The shallow, well drained Yawdim soils are on knolls. They are droughty and low in productivity. The Lonna and Busby soils are highly susceptible to soil blowing. The Floweree soils do not adversely affect the use and management of this unit as rangeland and for nonirrigated farming.

Typically, this Cambeth soil has a surface layer of brown silt loam 6 inches thick. The subsoil is light

yellowish brown and pale yellow silt loam 7 inches thick. The substratum to a depth of 35 inches is pale yellow silt loam. Below this to a depth of 60 inches or more are white, weakly consolidated, silty sedimentary beds. Sedimentary beds are at a depth of 20 to 40 inches.

Permeability is moderate, and available water capacity is moderate. Effective rooting depth is limited by the sedimentary beds at a depth of 20 to 40 inches. Where this soil is under native vegetation, the average annual wetting depth is 20 to 24 inches. Runoff is slow to medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate. This soil is calcareous below a depth of 6 inches.

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

Cropland.—This soil is well suited to nonirrigated crops. It is limited mainly by moderate available water capacity and the hazards of water erosion and soil blowing. Minimum tillage, contour cultivation, stripcropping, tall grass barriers, grassed waterways, and return of crop residue to the soil reduce soil blowing and water erosion. Tall grass barriers also reduce evaporation and trap snow, which increases the amount of moisture in the soil. Return of crop residue also helps to maintain good soil tilth. Chiseling stubble fields in fall on the contour or across the slope reduces runoff and water erosion.

Rangeland.—The potential native plant community is mainly western wheatgrass, green needlegrass, little bluestem, bluebunch wheatgrass, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, perennial short grasses, threadleaf sedge, fringed sagewort, silver sagebrush, and perennial forbs increases. If excessive grazing continues, plants such as annuals, weedlike forbs, and Kentucky bluegrass may invade. The potential native plant community produces about 1,600 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,000 pounds in years of below-normal precipitation.

The surface layer is susceptible to water erosion and soil blowing if it is disturbed or the range is overgrazed. Proper grazing use insures good plant vigor and adequate plant cover. Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Areas of deteriorated rangeland can be improved by mechanical treatment practices such as shallow chiseling and scalping.

Windbreaks.—This soil is suited to windbreaks, but the limited moisture supply restricts the choice of trees and shrubs. Suitable trees for planting are Russian-olive, Siberian elm, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, and skunkbush sumac.

Homesite development.—This soil is poorly suited to homesite development. It is limited mainly by the slow permeability of the underlying sedimentary beds, shrink-swell potential, and low soil strength. Shrinking and swelling and low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. This soil is poorly suited to septic tank absorption fields because of the slow permeability of the underlying sedimentary beds.

This map unit is in capability subclass IIIe, nonirrigated. It is in Silty range site, 10- to 14-inch precipitation zone.

42—Cambeth-Cabbart silt loams, 8 to 15 percent slopes. This map unit is on hills and ridges in the west-central and southwestern parts of the county. Slopes are mainly 250 to 1,000 feet long. Elevation is 1,900 to 2,600 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

This unit is about 50 percent Cambeth silt loam and 35 percent Cabbart silt loam. The moderately sloping Cambeth soil is on the sides and tops of hills, and the Cabbart soil is on the tops of hills and ridges.

Included in this unit are small areas of Yawdim, Busby, Yamac, and Fleak soils. Included areas make up about 15 percent of the total acreage. The shallow, well drained Yawdim soils and the shallow, somewhat excessively drained Fleak soils are on the tops of hills and ridges. They are droughty and are low in productivity. The Busby and Yamac soils do not adversely affect the use and management of this unit as rangeland and for nonirrigated farming.

The Cambeth soil is moderately deep and well drained. It formed in material derived dominantly from weakly consolidated, silty sedimentary beds. Typically, the surface layer is brown silt loam 6 inches thick. The subsoil is mostly light yellowish brown silt loam 7 inches thick. The substratum to a depth of 35 inches is pale yellow silt loam. Below this to a depth of 60 inches or more are white, weakly consolidated, silty sedimentary beds. Sedimentary beds are at a depth of 20 to 40 inches.

Permeability is moderate, and available water capacity is moderate. Effective rooting depth is limited by the sedimentary beds at a depth of 20 to 40 inches. Where this soil is under native vegetation, the average annual wetting depth is 20 to 24 inches. Runoff is medium, and the hazard of water erosion is high. The hazard of soil blowing is high. This soil is calcareous throughout.

The Cabbart soil is shallow and well drained. It formed in material derived from weakly consolidated, sandy and silty sedimentary beds. Typically, the surface layer is grayish brown silt loam 4 inches thick. The underlying material to a depth of 13 inches is pale olive silt loam. Below this to a depth of 60 inches or more are pale yellow, weakly consolidated, sandy and silty sedimentary

beds. Sedimentary beds are at a depth of 10 to 20 inches.

Permeability is moderate, and available water capacity is very low. Effective rooting depth is limited by the sedimentary beds at a depth of 10 to 20 inches. Where this soil is under native vegetation, the average annual wetting depth is 10 to 20 inches. Runoff is medium, and the hazard of water erosion is high. This soil is calcareous throughout. It is droughty.

These soils are used primarily as rangeland. They are also used for nonirrigated farming. The main nonirrigated crops are wheat, oats, and barley.

Cropland.—These soils are suited to nonirrigated crops. They are limited mainly by the hazards of soil blowing and water erosion. The Cabbart soil is also limited by very low available water capacity. The surface layer of this soil is high in content of lime and low in content of organic matter. Crops on these soils respond well to the application of phosphorus and nitrogen. Using green manure crops, barnyard manure, and crop residue increases the organic matter content and fertility. Minimum tillage, contour cultivation, stripcropping, tall grass barriers, grassed waterways, and return of crop residue to the soil reduce soil blowing and water erosion. Tall grass barriers also reduce evaporation and trap snow, which increases the amount of moisture in the soil. Return of crop residue also helps to maintain good soil tilth. Chiseling stubble fields in fall on the contour or across the slope reduces runoff and water erosion.

Rangeland.—The potential native plant community on the Cambeth soil is mainly western wheatgrass, green needlegrass, little bluestem, bluebunch wheatgrass, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, perennial short grasses, threadleaf sedge, fringed sagewort, and perennial forbs increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,600 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,000 pounds in years of below-normal precipitation.

The potential native plant community on the Cabbart soil is mainly bluebunch wheatgrass, little bluestem, western wheatgrass, sideoats grama, and plains muhly. If the range is excessively grazed, the proportion of these grasses decreases and the proportion of needleandthread, perennial short grasses, perennial forbs, and creeping juniper increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,200 pounds per acre of air-dry vegetation in years of above-normal precipitation and 700 pounds in years of below-normal precipitation.

The surface layer of these soils is susceptible to water erosion and soil blowing if it is disturbed or the range is overgrazed. Proper grazing use insures good plant vigor and adequate plant cover. Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Areas of deteriorated rangeland can be improved by mechanical treatment practices such as shallow chiseling and scalping. Conducting fieldwork on the contour or across the slope, where practical, reduces erosion and conserves moisture.

Windbreaks.—The Cambeth soil is suited to windbreaks, but the limited moisture supply restricts the choice of trees and shrubs. Suitable trees for planting are Russian-olive, Siberian elm, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, and skunkbush sumac.

The Cabbart soil is not suited to windbreaks. It is limited mainly by the very low available water capacity.

Homesite development.—These soils are poorly suited to homesite development. They are limited mainly by slow permeability of the underlying sedimentary beds, shrink-swell potential, and low soil strength. Shrinking and swelling and low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. These soils are poorly suited to septic tank absorption fields because of the slow permeability of the underlying sedimentary beds. In the construction of basements or foundations for dwellings, the limitation of shrink-swell potential can be overcome by backfilling with suitable material that has low shrink-swell potential.

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

43—Cambeth-Twilight-Cabbart complex, 4 to 15 percent slopes. This map unit is on uplands in the west-central and southwestern parts of the county. Slopes are mainly 250 to 1,000 feet long. Elevation is 1,900 to 2,600 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

This unit is about 40 percent Cambeth silt loam, 30 percent Twilight fine sandy loam, and 20 percent Cabbart silt loam. The Cambeth and Twilight soils are on the sides of hills and ridges, and the Cabbart soil is on the tops of hills and ridges.

Included in this unit are small areas of Fleak, Yamac, and Yawdim soils. Included areas make up about 10 percent of the total acreage. The shallow, well drained Yawdim soils and the shallow, somewhat excessively drained Fleak soils are on the tops of hills and ridges. They are droughty and are low in productivity. The Yamac soils do not adversely affect the use and management of this unit as rangeland and for nonirrigated farming.

The Cambeth soil is moderately deep and well drained. It formed in material derived dominantly from weakly consolidated, silty sedimentary beds. Typically, the surface layer is brown silt loam 6 inches thick. The subsoil is mostly light yellowish brown silt loam 7 inches thick. The substratum to a depth of 35 inches is pale yellow silt loam. Below this to a depth of 60 inches are more white, weakly consolidated, silty sedimentary beds. Sedimentary beds are at a depth of 20 to 40 inches.

Permeability is moderate, and available water capacity is moderate. Effective rooting depth is limited by the sedimentary beds at a depth of 20 to 40 inches. Where this soil is under native vegetation, the average annual wetting depth is 20 to 24 inches. Runoff is medium, and the hazard of water erosion is high. The hazard of soil blowing is high. This soil is calcareous throughout.

The Twilight soil is moderately deep and well drained. It formed in material derived from weakly consolidated, sandy sedimentary beds. Typically, the surface layer is brown fine sandy loam 5 inches thick. The upper 5 inches of the subsoil is brown fine sandy loam, and the lower 6 inches is pale brown fine sandy loam. The substratum to a depth of 25 inches is light brownish gray sandy loam. Below this to a depth of 60 inches or more are light brownish gray, weakly consolidated, sandy sedimentary beds. Sedimentary beds are at a depth of 20 to 40 inches.

Permeability is moderately rapid, and available water capacity is low. Effective rooting depth is limited by the sedimentary beds at a depth of 20 to 40 inches. Where this soil is under native vegetation, the average annual wetting depth is 20 to 30 inches. Runoff is slow to medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high. This soil is droughty.

The Cabbart soil is shallow and well drained. It formed in material derived from weakly consolidated, sandy and silty sedimentary beds. Typically, the surface layer is grayish brown silt loam 4 inches thick. The underlying material to a depth of 13 inches is pale olive silt loam. Below this to a depth of 60 inches or more are pale yellow, weakly consolidated, sandy and silty sedimentary beds. Sedimentary beds are at a depth of 10 to 20 inches.

Permeability is moderate, and available water capacity is very low. Effective rooting depth is limited by the sedimentary beds at a depth of 10 to 20 inches. Where this soil is under native vegetation, the average annual wetting depth is 10 to 20 inches. Runoff is medium, and the hazard of water erosion is high. The hazard of soil blowing is high. This soil is calcareous throughout. It is droughty.

Most areas of these soils are used as rangeland. A few areas are used for nonirrigated farming. The main nonirrigated crops are wheat, oats, and barley.

Cropland.—If these soils are used for nonirrigated crops, they are limited mainly by the restricted available water capacity and the hazards of soil blowing and water erosion. The Cabbart soil is droughty and is low in productivity. The restricted available water capacity of the soils makes water conservation necessary. Minimum tillage, contour cultivation, stripcropping, tall grass barriers, grassed waterways, and return of crop residue to the soil reduce soil blowing and water erosion. Tall grass barriers also reduce evaporation and trap snow, which increases the amount of moisture in the soil. Return of crop residue also helps to maintain good soil tilth. Chiseling stubble fields in fall on the contour or across the slope reduces runoff and water erosion.

Rangeland.—The potential native plant community on the Cambeth soil is mainly western wheatgrass, green needlegrass, little bluestem, bluebunch wheatgrass, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, perennial short grasses, threadleaf sedge, fringed sagewort, silver sagebrush, and perennial forbs increases. If excessive grazing continues, plants such as annuals, weedlike forbs, and Kentucky bluegrass may invade. The potential native plant community produces about 1,600 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,000 pounds in years of below-normal precipitation.

The potential native plant community on the Twilight soil is mainly prairie sandreed, little bluestem, thickspike wheatgrass, and needleandthread. If the range is excessively grazed, the proportion of prairie sandreed and little bluestem decreases and the proportion of thickspike wheatgrass, needleandthread, perennial short grasses, threadleaf sedge, perennial forbs, and yucca increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,800 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,000 pounds in years of below-normal precipitation.

The potential native plant community on the Cabbart soil is mainly bluebunch wheatgrass, little bluestem, western wheatgrass, sideoats grama, and plains muhly. If the range is excessively grazed, the proportion of these grasses decreases and the proportion of needleandthread, perennial short grasses, perennial forbs, and creeping juniper increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,200 pounds per acre of air-dry vegetation in years of above-normal precipitation and 700 pounds in years of below-normal precipitation.

The surface layer of these soils is susceptible to water erosion and soil blowing if it is disturbed or the range is overgrazed. Proper grazing use insures good plant vigor and adequate plant cover. Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Areas of deteriorated rangeland can be improved by mechanical treatment practices such as

shallow chiseling and scalping. All tillage should be on the contour or across the slope.

Windbreaks.—The Cambeth soil is suited to windbreaks, but the limited moisture supply restricts the choice of trees and shrubs. Suitable trees for planting are Russian-olive, Siberian elm, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, and skunkbush sumac.

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

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

Homesite development.—The Cambeth and Cabbart soils are poorly suited to homesite development. They are limited mainly by the slow permeability of the underlying sedimentary beds, shrink-swell potential, and low soil strength. Shrinking and swelling and low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. These soils are poorly suited to septic tank absorption fields because of the slow permeability of the underlying sedimentary beds.

The Twilight soil is suited to homesite development. It has few limitations.

This map unit is in capability subclass IVe, nonirrigated. The Cambeth soil is in Silty range site, 10- to 14-inch precipitation zone; the Twilight soil is in Sandy range site, 10- to 14-inch precipitation zone; and the Cabbart soil is in Shallow range site, 10- to 14-inch precipitation zone.

44—Cherry silt loam, 0 to 4 percent slopes. This deep, well drained soil is on fans and terraces in the east-central and southeastern parts of the county. It formed in alluvium. Slopes are mainly 250 feet to more than 1,000 feet long. Elevation is 1,900 to 3,400 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Alona, Bryant, Cambert, and Havrelon soils. The Alona soils are moderately salt-affected and strongly sodium-affected and are on terraces and fans. The salts and sodium reduce the availability of moisture and some plant nutrients, which limits crop yields. The Havrelon soils are on low terraces and flood plains. They are subject to flooding. The Bryant and Cambert soils do not adversely affect the use and management of this unit as rangeland and for nonirrigated and irrigated farming.

Typically, this Cherry soil has a surface layer of light brownish gray silt loam 3 inches thick. The subsoil is mostly pale yellow and light brownish gray silt loam 21 inches thick. The substratum to a depth of 60 inches or more is pale yellow and light brownish gray silt loam.

Permeability is moderately slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 30 inches. Runoff is slow, and the hazard of water erosion is slight to moderate. The hazard of soil blowing is high. This soil is calcareous throughout.

This soil is used as rangeland, for irrigated farming, and for nonirrigated farming. The main nonirrigated and irrigated crops are wheat, oats, and barley. Irrigated alfalfa hay is also grown.

Cropland.—This soil is well suited to nonirrigated and irrigated crops. It is limited mainly by the hazards of soil blowing and water erosion. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, stubble mulch tillage, and grassed waterways reduce soil blowing and water erosion. The surface layer of this soil is high in content of lime and low in content of organic matter. Crops respond well to the application of phosphorus and nitrogen. Using green manure crops, barnyard manure, and crop residue increases the organic matter content and fertility.

In summer, irrigation is required for maximum production of most crops. Furrow, border, corrugation, and sprinkler irrigation systems are suited to this soil. Leveling is needed in sloping areas for the efficient application and removal of irrigation water.

Rangeland.—The potential native plant community is mainly western wheatgrass, green needlegrass, little bluestem, bluebunch wheatgrass, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, blue grama, fringed sagewort, silver sagebrush, and perennial forbs increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,800 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,200 pounds in years of below-normal precipitation.

The surface layer is susceptible to water erosion and soil blowing if it is disturbed or the range is overgrazed. Proper grazing use insures good plant vigor and adequate plant cover. Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Areas of deteriorated rangeland can be improved by mechanical treatment practices such as shallow chiseling and scalping.

Windbreaks.—This soil is suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian elm, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, and skunkbush sumac.

Homesite development.—This soil is poorly suited to homesite development. It is limited mainly by low soil strength, shrink-swell potential, and moderately slow

permeability. If this soil is used for septic tank absorption fields, the limitation of moderately slow permeability can be overcome by increasing the size of the absorption field. If buildings are constructed on this soil, properly designing foundations and footings and diverting runoff away from buildings help to prevent structural damage as a result of shrinking and swelling. Shrinking and swelling and low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations.

This map unit is in capability subclasses IIIe, nonirrigated, and IIe, irrigated. It is in Silty range site, 10- to 14-inch precipitation zone.

45—Cherry-Havrelon-Trembles complex, 0 to 2 percent slopes. This map unit is on terraces and flood plains along the major drainageways in the eastern part of the county. Slopes are mainly less than 1,000 feet long. Elevation is 1,900 to 3,400 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

This unit is about 30 percent Cherry silt loam, 30 percent Havrelon loam, and 30 percent Trembles fine sandy loam. The Havrelon and Trembles soils are on flood plains and low terraces, and the Cherry soil is on high terraces.

Included in this unit are small areas of Alona soils; Typic Fluvaquents, saline; and Shambo soils. Also included are small areas of soils on short, steep slopes along terrace edges. Included areas make up about 10 percent of the total acreage. The Alona soils are moderately salt-affected and strongly sodium-affected. The salts and sodium reduce the availability of moisture and some plant nutrients, which limits crop yields. The Typic Fluvaquents, saline, are in stream channels and on narrow flood plains. The Shambo soils do not adversely affect the use and management of this unit as rangeland and for nonirrigated and irrigated farming.

The Cherry soil is deep and well drained. It formed in alluvium. Typically, the surface layer is light brownish gray silt loam 3 inches thick. The subsoil is mostly pale yellow and light brownish gray silt loam 21 inches thick. The substratum to a depth of 60 inches or more is mostly light brownish gray silt loam.

Permeability is moderately slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 30 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high. This soil is calcareous throughout.

The Havrelon soil is deep and well drained. It formed in alluvium. Typically, the surface layer is pale brown loam 5 inches thick. The underlying material to a depth of 60 inches or more is pale brown very fine sandy loam.

Permeability is moderate, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 30 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate. This soil is subject to occasional periods of flooding during prolonged, high intensity storms. Channeling and deposition are common along streambanks. This soil is calcareous throughout.

The Trembles soil is deep and well drained. It formed in alluvium. Typically, the surface layer is grayish brown fine sandy loam 6 inches thick. The underlying material to a depth of 60 inches or more is yellowish brown and light brownish gray fine sandy loam.

Permeability is moderately rapid, and available water capacity is moderate. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 36 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high. This soil is subject to occasional periods of flooding during prolonged, high intensity storms. Channeling and deposition are common along streambanks. The soil is calcareous throughout.

These soils are used as rangeland and for nonirrigated and irrigated farming. The main nonirrigated and irrigated crops are wheat, oats, and barley. Irrigated alfalfa hay is also grown.

Cropland.—These soils are suited to nonirrigated and irrigated crops. They are limited mainly by the hazard of soil blowing. The surface layer of these soils has low organic matter content. Crops respond well to the application of phosphorus and nitrogen. Using green manure crops, barnyard manure, and crop residue increases organic matter content and increases fertility. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, and stubble mulch tillage reduce soil blowing.

In summer, irrigation is required for maximum production of most crops. Sprinkler irrigation is the most suitable method of applying water. Use of this method permits the even, controlled application of water, reduces runoff, and minimizes the risk of erosion. Water spreading is also used to irrigate these soils. To provide an adequate length of run, land leveling may be needed to level the short, steep terrace edges.

Rangeland.—The potential native plant community on the Cherry and Havrelon soils is mainly western wheatgrass, green needlegrass, little bluestem, big bluestem, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, perennial short grasses, silver sagebrush, and perennial forbs increases. If excessive grazing continues, plants such as thistles, Kentucky bluegrass, annuals, and weedlike forbs may invade. The potential native plant community on the Havrelon soil produces about 2,000 pounds per acre of

air-dry vegetation in years of above-normal precipitation and 1,200 pounds in years of below-normal precipitation. On the Cherry soil it produces about 1,800 pounds per acre in years of above-normal precipitation and 1,200 pounds in years of below-normal precipitation.

The potential native plant community on the Trembles soil is mainly prairie sandreed, little bluestem, big bluestem, and needleandthread. If the range is excessively grazed, the proportion of prairie sandreed, little bluestem, and big bluestem decreases and the proportion of needleandthread, thickspike wheatgrass, blue grama, and silver sagebrush increases. If excessive grazing continues, plants such as thistles, annuals, and weedlike forbs may invade. The potential native plant community produces about 2,000 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,200 pounds in years of below-normal precipitation.

The surface layer of these soils is susceptible to water erosion and soil blowing if it is disturbed or the range is overgrazed. Proper grazing use insures good plant vigor and adequate plant cover. Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Areas of deteriorated rangeland can be improved by mechanical treatment practices such as shallow chiseling and scalping. If the plant cover is disturbed for seeding or mechanical treatment, protection from flooding may be needed to control gullying and sheet erosion until the plant cover is sufficiently reestablished.

Windbreaks.—The Cherry soil is suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian elm, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, and skunkbush sumac.

The Havrelon soil is well suited to windbreaks. Suitable trees for planting are Russian-olive, white willow, golden willow, Siberian elm, Siberian crabapple, black hawthorn, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and western sandcherry.

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

Homesite development.—These soils are poorly suited to homesite development. The Cherry soil is limited mainly by low soil strength, shrink-swell potential, and moderately slow permeability. Use of gravel backfill in the septic tank absorption line trench, excavated to a suitable depth, helps to compensate for the moderately slow permeability. If buildings are constructed on this soil, properly designing foundations and footings and diverting runoff away from buildings help to prevent structural damage as a result of shrinking and swelling. Shrinking and swelling and low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations.

The Havrelon and Trembles soils are poorly suited to homesite development because of the hazard of occasional flooding.

This map unit is in capability subclasses IIIw, nonirrigated and irrigated. The Cherry and Havrelon soils are in Silty range site, 10- to 14-inch precipitation zone, and the Trembles soil is in Sandy range site, 10- to 14-inch precipitation zone.

46—Chinook fine sandy loam, 0 to 4 percent slopes. This deep, well drained soil is on fans and terraces in the northwestern part of the county. It formed in alluvial and eolian material. Slopes are mainly more than 1,000 feet long. Elevation is 1,900 to 2,600 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Yamac, Floweree, and Rominell soils. The deep, well drained, salt- and sodium-affected Rominell soils are on fans and terraces. The content of salts and sodium in these soils reduces the availability of moisture and some plant nutrients. Also, it restricts the penetration of roots and moisture, which limits crop yields. The Yamac and Floweree soils do not adversely affect the use and management of this unit as rangeland and for nonirrigated farming.

Typically, this Chinook soil has a surface layer of dark grayish brown fine sandy loam 6 inches thick. The subsoil is mostly brown fine sandy loam 23 inches thick. The substratum to a depth of 60 inches or more is grayish brown and light brownish gray sandy loam.

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

This soil is used mainly as rangeland. It is also used for nonirrigated farming. The main nonirrigated crops are wheat, oats, and barley.

Cropland.—This soil is suited to nonirrigated crops. It is limited mainly by the high hazard of soil blowing and moderate available water capacity. Stripcropping and planting field windbreaks help to control soil blowing and conserve moisture.

Rangeland.—The potential native plant community is mainly prairie sandreed, little bluestem, big bluestem, and needleandthread. If the range is excessively grazed, the proportion of prairie sandreed, little bluestem, and big bluestem decreases and the proportion of

needleandthread, perennial short grasses, perennial forbs, and silver sagebrush increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,800 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,200 pounds in years of below-normal precipitation.

Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Areas of deteriorated rangeland can be improved by mechanical treatment practices such as shallow chiseling and scalping.

Windbreaks.—This soil is suited to windbreaks, but the limited moisture supply restricts the choice of trees and shrubs. Suitable trees for planting are Russian-olive, Siberian elm, white willow, golden willow, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, skunkbush sumac, and silver buffaloberry.

Homesite development.—This soil is well suited to homesite development. It has few limitations. In places, excavation for roads can expose material that is highly susceptible to soil blowing.

This map unit is in capability subclass IIIe, nonirrigated. It is in Sandy range site, 10- to 14-inch precipitation zone.

47—Chinook fine sandy loam, 4 to 8 percent slopes. This deep, well drained soil is on fans and foot slopes in the western part of the county. It formed in alluvial and eolian material. Slopes are mainly more than 1,000 feet long. Elevation is 1,900 to 2,600 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Yamac, Fleak, Floweree, and Rominell soils. The deep, well drained, salt- and sodium-affected Rominell soils are on fans and foot slopes. The content of salts and sodium in these soils reduces the availability of moisture and some plant nutrients. Also, it restricts the penetration of roots and moisture, which limits crop yields. The shallow, somewhat excessively drained Fleak soils are on the upper side slopes and tops of hills and ridges. They are droughty and are low in productivity. The Yamac and Floweree soils do not adversely affect the use and management of this unit as rangeland and for nonirrigated farming.

Typically, this Chinook soil has a surface layer of dark grayish brown fine sandy loam 6 inches thick. The subsoil is brown and light brownish gray fine sandy loam 23 inches thick. The substratum to a depth of 60 inches or more is grayish brown and light brownish gray sandy loam.

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

This soil is used mainly as rangeland. It is also used for nonirrigated farming. The main nonirrigated crops are wheat, oats, and barley.

Cropland.—This soil is suited to nonirrigated crops. It is limited mainly by the hazards of soil blowing and water erosion and moderate available water capacity. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, stubble mulch tillage, and grassed waterways reduce soil blowing and water erosion. Tall grass barriers also trap snow, which increases the amount of moisture in the soil.

Rangeland.—The potential native plant community is mainly prairie sandreed, little bluestem, big bluestem, and needleandthread. If the range is excessively grazed, the proportion of prairie sandreed, little bluestem, and big bluestem decreases and the proportion of needleandthread, perennial short grasses, perennial forbs, and silver sagebrush increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,800 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,200 pounds in years of below-normal precipitation.

The surface layer is susceptible to water erosion and soil blowing if it is disturbed or the range is overgrazed. Proper grazing use insures good plant vigor and adequate plant cover. Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Areas of deteriorated rangeland can be improved by mechanical treatment practices such as shallow chiseling and scalping.

Windbreaks.—This soil is suited to windbreaks, but the limited moisture supply restricts the choice of trees and shrubs. Suitable trees for planting are Russian-olive, Siberian elm, white willow, golden willow, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, skunkbush sumac, and silver buffaloberry.

Homesite development.—This soil is well suited to homesite development. It has few limitations. In places, excavation for roads can expose material that is highly susceptible to soil blowing.

This map unit is in capability subclass IVe, nonirrigated. It is in Sandy range site, 10- to 14-inch precipitation zone.

48—Chinook fine sandy loam, 8 to 15 percent slopes. This deep, well drained soil is on hillsides in the west-central part of the county. It formed in alluvial and eolian material. Slopes are mainly less than 250 feet long. Elevation is 1,900 to 2,600 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Busby, Kremlin, Fleak, and Yamac soils. The shallow, somewhat excessively drained Fleak soils are on the upper side slopes and tops of hills and ridges. These soils are droughty and are low in productivity. The Busby, Kremlin, and Yamac soils do not adversely affect the use and management of this unit as rangeland and for nonirrigated farming.

Typically, this Chinook soil has a surface layer of dark grayish brown fine sandy loam 6 inches thick. The subsoil is mostly brown fine sandy loam 23 inches thick. The substratum to a depth of 60 inches or more is grayish brown and light brownish gray sandy loam.

Permeability is moderately rapid, and available water capacity is moderate. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 28 inches. Runoff is slow to medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high.

Most areas of this soil are used as rangeland. A few areas are used for nonirrigated farming. The main nonirrigated crops are wheat, oats, and barley.

Cropland.—This soil is suited to nonirrigated crops. It is limited mainly by the hazards of water erosion and soil blowing and by moderate available water capacity. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, stubble mulch tillage, and grassed waterways reduce soil blowing and water erosion. Tall grass barriers also trap snow, which increases the amount of moisture in the soil.

Rangeland.—The potential native plant community is mainly prairie sandreed, little bluestem, big bluestem, and needleandthread. If the range is excessively grazed, the proportion of prairie sandreed, little bluestem, and big bluestem decreases and the proportion of needleandthread, perennial short grasses, perennial forbs, and silver sagebrush increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,800 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,000 pounds in years of below-normal precipitation.

The surface layer is susceptible to water erosion and soil blowing if it is disturbed or the range is overgrazed. Proper grazing use insures good plant vigor and adequate plant cover. Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Areas of deteriorated rangeland can be improved by mechanical treatment practices such as shallow chiseling and scalping.

Windbreaks.—This soil is suited to windbreaks, but the limited moisture supply restricts the choice of trees and shrubs. Suitable trees for planting are Russian-olive, Siberian elm, white willow, golden willow, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, skunkbush sumac, and silver buffaloberry.

Homesite development.—This soil is well suited to homesite development. In places, excavation for roads can expose material that is highly susceptible to soil blowing. Slope is a concern in installing septic tank absorption fields. Absorption lines should be installed on the contour.

This map unit is in capability subclass IVe, nonirrigated. It is in Sandy range site, 10- to 14-inch precipitation zone.

49—Chinook fine sandy loam, gullied, 2 to 8 percent slopes. This deep, well drained soil is on fans, foot slopes, and terraces in the north-central and west-central parts of the county. It commonly is dissected by gullies. The soil formed in alluvial and eolian material. Slopes are mainly 250 to 1,000 feet long. Elevation is 1,900 to 2,600 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Rominell; Rominell, gullied; Fleak; Twilight; and Kremlin soils. These areas do not adversely affect the use and management of this unit as rangeland.

Typically, this Chinook soil has a surface layer of dark grayish brown fine sandy loam 6 inches thick. The subsoil is mostly brown fine sandy loam 23 inches thick. The substratum to a depth of 60 inches or more is grayish brown and light brownish gray sandy loam.

Permeability is moderately rapid, and available water capacity is moderate. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 28 inches. Runoff is slow, and the hazard of water erosion is moderate. The hazard of soil blowing is high.

This soil is used as rangeland.

Cropland.—This soil is poorly suited to cultivated crops because the many deep, narrow gullies make tillage difficult. The gullies are 2 to 10 feet deep, as much as 5 feet wide, and 100 to 500 feet apart. They are produced by concentrated runoff from adjacent areas of Badland.

Rangeland.—The potential native plant community is mainly prairie sandreed, little bluestem, big bluestem, and needleandthread. If the range is excessively grazed, the proportion of prairie sandreed, little bluestem, and big bluestem decreases and the proportion of needleandthread, perennial short grasses, perennial forbs, and silver sagebrush increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,800 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,200 pounds in years of below-normal precipitation.

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

Proper grazing use insures good plant vigor and adequate plant cover. The many deep, narrow gullies make seeding and mechanical treatment difficult.

Windbreaks.—Smooth areas of this soil between the gullies are suited to windbreaks, but the limited moisture supply restricts the choice of trees and shrubs. Suitable trees for planting are Russian-olive, Siberian elm, white willow, golden willow, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, skunkbush sumac, and silver buffaloberry.

Homesite development.—This soil is suited to homesite development. The main limitation is the many gullies, which limit access. In places, excavation for roads can expose material that is highly susceptible to soil blowing.

This map unit is in capability subclass VIe, nonirrigated. It is in Sandy range site, 10- to 14-inch precipitation zone.

50—Creed loam, 0 to 8 percent slopes. This deep, well drained, salt- and sodium-affected soil is on fans and terraces in the western and northern parts of the county. It formed in alluvium. Slopes are mainly more than 1,000 feet long. Elevation is 1,900 to 2,600 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Kremlin, Gerdrum, Chinook, and Ethridge soils. The Chinook soils are highly susceptible to soil blowing. The Kremlin, Gerdrum, and Ethridge soils do not adversely affect the use and management of this unit as rangeland and for nonirrigated farming.

Typically, this Creed soil has a surface layer of grayish brown loam 3 inches thick. The subsurface layer is grayish brown and light brownish gray loam 5 inches thick. The subsoil is light brownish gray silty clay 16 inches thick. The substratum to a depth of 60 inches or more is light brownish gray silty clay and silty clay loam.

Permeability is slow, and available water capacity is moderate. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 24 inches. Runoff is slow to medium, and the hazard of water erosion is slight to moderate. The hazard of soil blowing is moderate. This soil is slightly salt-affected and moderately sodium-affected at a depth of about 8 inches.

Most areas of this soil are used as rangeland. A few areas are used for nonirrigated farming. The main nonirrigated crops are wheat, oats, and barley.

Cropland.—If this soil is used for nonirrigated crops, it is limited by the content of salts in the subsoil and the hazards of soil blowing and water erosion. Minimum tillage, contour cultivation, stripcropping, tall grass barriers, grassed waterways, and return of crop residue to the soil reduce soil blowing and water erosion. Tall grass barriers also reduce evaporation and trap snow, which increases the amount of moisture in the soil. Return of crop residue also helps to maintain good soil tilth. Chiseling stubble fields in fall on the contour or across the slope reduces runoff and water erosion. Subsoiling improves infiltration of the water and allows salts to be leached downward.

Rangeland.—The potential native plant community is mainly western wheatgrass, green needlegrass, thickspike wheatgrass, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, blue grama, perennial forbs, fringed sagewort, and big sagebrush increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,500 pounds per acre of air-dry vegetation in years of above-normal precipitation and 800 pounds in years of below-normal precipitation.

The surface layer is susceptible to water erosion and soil blowing if it is disturbed or the range is overgrazed. Proper grazing use insures good plant vigor and adequate plant cover. Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Areas of deteriorated rangeland can be improved by mechanical practices such as shallow chiseling and scalping.

Windbreaks.—This soil is suited to windbreaks. It is salt-affected, however, which limits the choice of trees and shrubs to those that are salt-tolerant. Suitable trees for planting are Russian-olive, black hawthorn, Siberian elm, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, common chokecherry, skunkbush sumac, and silver buffaloberry.

Homesite development.—This soil is poorly suited to homesite development. It is limited mainly by slow permeability, shrink-swell potential, and low soil strength. In the construction of basements or foundations for dwellings, the limitation of shrink-swell potential can be overcome by backfilling with suitable material that has low shrink-swell potential. If this soil is used for septic tank absorption fields, the limitation of slow permeability can be overcome by increasing the size of the absorption field or by excavating the trench to a suitable depth. The field or trench should be backfilled with gravel. Shrinking and swelling and low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations.

This map unit is in capability subclass IVe, nonirrigated. It is in Clay Pan range site, 10- to 14-inch precipitation zone.

51—Creed-Gerdrum complex, 0 to 8 percent slopes. This map unit is on fans and terraces in the western and northern parts of the county. Slopes are

mainly less than 1,000 feet long. Elevation is 1,900 to 2,600 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

This unit is about 50 percent Creed loam and 35 percent Gerdrum clay loam. The Gerdrum soil is in small depressional areas surrounded by the Creed soil.

Included in this unit are small areas of Kremlin, Thoeny, Absher, and Fleak soils and areas of sandstone and shale outcroppings. Included areas make up about 15 percent of the total acreage. The Absher soils are in small, shallow, barren depressional areas. These soils are moderately sodium-affected and strongly salt-affected and have a thin surface crust. These factors severely limit seedling emergence and the penetration of roots and moisture. The Fleak soils are shallow, well drained, and droughty. They are on knolls and ridges of low hills. The Absher and Fleak soils are low in productivity. The sandstone and shale outcroppings are on ridges of low hills and can be easily farmed around. The Kremlin and Thoeny soils do not adversely affect the use and management of this unit as rangeland and for nonirrigated farming.

The Creed soil is deep and well drained and is salt- and sodium-affected. It formed in alluvium. Typically, the surface layer is grayish brown loam 3 inches thick. The subsurface layer is grayish brown and light brownish gray loam 5 inches thick. The subsoil is light brownish gray silty clay 16 inches thick. The substratum to a depth of 60 inches or more is light brownish gray silty clay and silty clay loam.

Permeability is slow, and available water capacity is moderate. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 24 inches. Runoff is slow to medium, and the hazard of water erosion is slight to moderate. The hazard of soil blowing is moderate. This soil is slightly salt-affected and moderately sodium-affected at a depth of about 8 inches.

The Gerdrum soil is deep and well drained and is salt- and sodium-affected. It formed in alluvium. Typically, the surface layer, where mixed to a depth of 7 inches, is light brownish gray clay loam. The upper 4 inches of the subsoil is light brownish gray clay, and the lower 9 inches is light brownish gray clay loam. The substratum to a depth of 60 inches or more is mostly light brownish gray clay loam.

Permeability is slow, and available water capacity is moderate. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 24 inches. Runoff is slow to medium, and the hazard of water erosion is slight to moderate. The hazard of soil blowing is moderate. This soil is strongly salt-affected and moderately sodium-affected at a depth of about 7 inches.

Most areas of these soils are used as rangeland. A few areas are used for nonirrigated crops, mainly wheat, oats, and barley.

Cropland.—These soils are suited to nonirrigated crops. They are limited by the content of salts and sodium and by surface crusting of the Gerdrum soil. Both soils are susceptible to water erosion and soil blowing. Subsoiling improves water infiltration and allows salts to be leached downward. Minimum tillage, contour cultivation, stripcropping, tall grass barriers, grassed waterways, and return of crop residue to the soil reduce soil blowing and water erosion. Tall grass barriers also reduce evaporation and trap snow, which increases the amount of moisture in the soil. Return of crop residue also helps to maintain good soil tilth. Chiseling stubble fields in fall on the contour or across the slope reduces runoff and water erosion.

Rangeland.—The potential native plant community on the Creed soil is mainly western wheatgrass, green needlegrass, thickspike wheatgrass, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, blue grama, perennial forbs, fringed sagewort, big sagebrush, and other perennial short grasses increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,500 pounds per acre of air-dry vegetation in years of above-normal precipitation and 800 pounds in years of below-normal precipitation.

The potential native plant community on the Gerdrum soil is mainly western wheatgrass, green needlegrass, thickspike wheatgrass, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, blue grama, Sandberg bluegrass, big sagebrush, and perennial forbs increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,200 pounds per acre of air-dry vegetation in years of above-normal precipitation and 500 pounds in years of below-normal precipitation.

The surface layer of these soils is susceptible to water erosion and soil blowing if it is disturbed or the range is overgrazed. Proper grazing use insures good plant vigor and adequate plant cover. Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Areas of deteriorated rangeland can be improved by mechanical treatment practices such as chiseling, scalping, and contour furrowing.

Windbreaks.—The Creed soil is suited to windbreaks. It is salt-affected, however, which limits the choice of trees and shrubs to those that are salt-tolerant. Suitable trees for planting are Russian-olive, black hawthorn, Siberian elm, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, common chokecherry, skunkbush sumac, and silver buffaloberry.

The Gerdrum soil is suited to windbreaks. It is strongly salt-affected, however, which limits the choice of trees and shrubs to Russian-olive and silver buffaloberry.

Homesite development.—These soils are poorly suited to homesite development. They are limited mainly by slow permeability, shrink-swell potential, and low soil strength. In the construction of basements or foundations for dwellings, the limitation of shrink-swell potential can be overcome by backfilling with suitable material that has low shrink-swell potential. If these soils are used for septic tank absorption fields, the limitation of slow permeability can be overcome by increasing the size of the absorption field or by excavating the trench to a suitable depth. The field or trench should be backfilled with gravel. Shrinking and swelling and low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations.

This map unit is in capability subclass IVe, nonirrigated. Both soils are in Clay Pan range site, 10- to 14-inch precipitation zone.

52—Dast fine sandy loam, 2 to 8 percent slopes. This moderately deep, well drained soil is on the sides and tops of knolls and low hills in the east-central and southeastern parts of the county. It formed in material derived from weakly consolidated, sandy sedimentary beds. Slopes are mainly less than 1,000 feet long. Elevation is 1,900 to 3,400 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Lisk, Cambert, Macar, Shambo, and Tally soils. These areas do not adversely affect the use and management of this unit as rangeland and for nonirrigated farming.

Typically, this Dast soil has a surface layer of brown fine sandy loam 3 inches thick. The underlying material to a depth of 25 inches is light gray and very pale brown fine sandy loam. Below this to a depth of 60 inches or more are pale yellow, weakly consolidated, sandy sedimentary beds. Sedimentary beds are at a depth of 20 to 40 inches.

Permeability is moderately rapid, and available water capacity is low. Effective rooting depth is limited by the sedimentary beds at a depth of 20 to 40 inches. Where this soil is under native vegetation, the average annual wetting depth is 20 to 36 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high. This soil is calcareous throughout. It is droughty.

This soil is used for nonirrigated farming and as rangeland. The main nonirrigated crops are wheat, oats, and barley.

Cropland.—This soil is suited to nonirrigated crops. It is limited mainly by low available water capacity and the high hazard of soil blowing. Because of droughtiness, successful crop production depends on receiving average or above-average rainfall during the early part of the growing season. Minimum tillage, tall grass barriers, stripcropping, and stubble mulch tillage conserve moisture and reduce soil blowing.

Rangeland.—The potential native plant community is mainly prairie sandreed, little bluestem, needleandthread, and thickspike wheatgrass. If the range is excessively grazed, the proportion of prairie sandreed and little bluestem decreases and the proportion of needleandthread, thickspike wheatgrass, perennial short grasses, threadleaf sedge, perennial forbs, and yucca increases. If excessive grazing continues, plants such as red threeawn, annuals, and weedlike forbs may invade. The potential native plant community produces about 1,800 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,000 pounds in years of below-normal precipitation.

Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Areas of deteriorated rangeland can be improved by mechanical treatment practices such as shallow chiseling.

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

Homesite development.—This soil is well suited to homesite development. It has few limitations. In places, excavation for roads can expose material that is highly susceptible to soil blowing.

This map unit is in capability subclass IIIe, nonirrigated. It is in Sandy range site, 10- to 14-inch precipitation zone.

53—Dast fine sandy loam, 8 to 15 percent slopes. This moderately deep, well drained soil is on the sides and tops of hills and ridges in the east-central and southeastern parts of the county. It formed in material derived from weakly consolidated, sandy sedimentary beds. Slopes are mainly less than 250 feet long. Elevation is 1,900 to 3,400 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Lisk, Cambert, Macar, Shambo, and Tally soils. Also included are small areas of sandstone outcroppings. The sandstone outcroppings are on the top of hills and ridges and can be farmed around. The included soils do not adversely affect the use and management of this unit for nonirrigated farming and as rangeland.

Typically, this Dast soil has a surface layer of brown fine sandy loam 3 inches thick. The underlying material to a depth of 25 inches is light gray and very pale brown

fine sandy loam. Below this to a depth of 60 inches or more are pale yellow, weakly consolidated, sandy sedimentary beds. Sedimentary beds are at a depth of 20 to 40 inches.

Permeability is moderately rapid, and available water capacity is low. Effective rooting depth is limited by the sedimentary beds at a depth of 20 to 40 inches. Where this soil is under native vegetation, the average annual wetting depth is 20 to 36 inches. Runoff is slow to medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high. This soil is calcareous throughout. It is droughty.

This soil is used for nonirrigated farming and as rangeland. The main nonirrigated crops are wheat, oats, and barley.

Cropland.—This soil is suited to nonirrigated crops. It is limited mainly by low available water capacity, the high hazard of soil blowing, and the moderate hazard of water erosion. Because of the droughtiness of the soil, successful crop production depends on receiving average or above-average rainfall during the early part of the growing season. Minimum tillage, tall grass barriers, stripcropping, and stubble mulch tillage conserve moisture and reduce soil blowing and water erosion. Water erosion is also reduced if fall grain is seeded early and tillage and seeding are on the contour or across the slope. Also, waterways should be shaped and seeded to perennial grass.

Rangeland.—The potential native plant community is mainly prairie sandreed, little bluestem, needleandthread, and thickspike wheatgrass. If the range is excessively grazed, the proportion of prairie sandreed and little bluestem decreases and the proportion of needleandthread, thickspike wheatgrass, perennial short grasses, threadleaf sedge, perennial forbs, and yucca increases. If excessive grazing continues, plants such as red threeawn, annuals, and weedlike forbs may invade. The potential native plant community produces about 1,800 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,000 pounds in years of below-normal precipitation.

Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Areas of deteriorated rangeland can be improved by mechanical treatment practices such as shallow chiseling. Conducting fieldwork on the contour or across the slope, where practical, reduces erosion and conserves moisture.

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

Homesite development.—This soil is suited to homesite development. Slope is a concern in installing septic tank absorption fields. Absorption lines should be installed on the contour. In places, excavation for roads can expose material that is highly susceptible to soil blowing.

This map unit is in capability subclass IVe, nonirrigated. It is in Sandy range site, 10- to 14-inch precipitation zone.

54—Dast-Blanchard complex, 2 to 8 percent slopes. This map unit is on low hills in the eastern part of the county. Slopes are mainly less than 1,000 feet long. Elevation is 1,900 to 3,400 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

This unit is about 50 percent Dast fine sandy loam and 35 percent Blanchard loamy sand. The Dast soil is on the sides and tops of hills, and the Blanchard soil is on fans and foot slopes and in areas that are protected from the prevailing winds.

Included in this unit are small areas of Lisk, Cabba, Macar, and Tally soils. Included areas make up about 15 percent of the total acreage. These areas do not adversely affect the use and management of this unit as rangeland and for nonirrigated farming.

The Dast soil is moderately deep and well drained. It formed in material derived from weakly consolidated, sandy sedimentary beds. Typically, the surface layer is brown fine sandy loam 3 inches thick. The underlying material to a depth of 25 inches is light gray and very pale brown fine sandy loam. Below this to a depth of 60 inches or more are pale yellow, weakly consolidated, sandy sedimentary beds. Sedimentary beds are at a depth of 20 to 40 inches.

Permeability is moderately rapid, and available water capacity is low. Effective rooting depth is limited by the sedimentary beds at a depth of 20 to 40 inches. Where this soil is under native vegetation, the average annual wetting depth is 20 to 36 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high. The soil is droughty.

The Blanchard soil is deep and excessively drained. It formed in sandy alluvial and eolian material. Typically, the surface layer is grayish brown loamy sand 7 inches thick. The upper 29 inches of the underlying material is light brownish gray loamy sand, and the lower part to a depth of 60 inches or more is light yellowish brown loamy coarse sand.

Permeability is rapid, and available water capacity is low. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 48 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high. The soil is droughty.

These soils are used mainly as rangeland. They are also used for nonirrigated farming. The main nonirrigated crops are wheat, oats, and barley.

Cropland.—These soils are poorly suited to cultivated crops. They are limited mainly by droughtiness and the high hazard of soil blowing. Because of the droughtiness of the soils, successful crop production depends on receiving average or above-average rainfall during the early part of the growing season. Minimum tillage, tall grass barriers, stripcropping, and stubble mulch tillage conserve moisture and reduce soil blowing. Tall grass barriers trap snow, which increases the amount of moisture in the soil.

Rangeland.—The potential native plant community on the Dast soil is mainly prairie sandreed, little bluestem, needleandthread, and thickspike wheatgrass. If the range is excessively grazed, the proportion of prairie sandreed and little bluestem decreases and the proportion of needleandthread, thickspike wheatgrass, perennial short grasses, threadleaf sedge, perennial forbs, and yucca increases. If excessive grazing continues, plants such as red threeawn, annuals, and weedlike forbs may invade. The potential native plant community produces about 1,800 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,000 pounds in years of below-normal precipitation.

The potential native plant community on the Blanchard soil is mainly sand bluestem, prairie sandreed, Indian ricegrass, little bluestem, and sun sedge. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, sand dropseed, perennial short grasses, threadleaf sedge, perennial forbs, and yucca increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 2,000 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,000 pounds in years of below-normal precipitation.

Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice on these soils. Special precautions must be taken to reduce soil blowing until the plant cover is reestablished.

Windbreaks.—These soils are suited to windbreaks, but the low available water capacity limits the growth of both trees and shrubs. Suitable trees for planting are Russian-olive, Siberian elm, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, western sandcherry, and skunkbush sumac.

Homesite development.—These soils are suited to homesite development. The Dast soil has few limitations. The Blanchard soil is limited mainly by the instability and rapid permeability of the underlying material. Therefore, cutbanks are not stable and are subject to slumping, and effluent from septic tank absorption fields may contaminate ground water. In places, excavation for roads can expose material that is highly susceptible to soil blowing.

This map unit is in capability subclass IVe, nonirrigated. The Dast soil is in Sandy range site, 10- to 14-inch precipitation zone, and the Blanchard soil is in Sands range site, 10- to 14-inch precipitation zone.

55—Dast-Blanchard complex, 8 to 25 percent slopes. This map unit is on hills and ridges in the east-central and southeastern parts of the county. Slopes are mainly less than 1,000 feet long. Elevation is 1,900 to 3,400 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

This unit is about 45 percent Dast fine sandy loam and 35 percent Blanchard loamy sand. The strongly sloping to moderately steep Dast soil is on the sides and tops of hills and ridges, and the strongly sloping Blanchard soil is on fans and foot slopes and in areas that are protected from the prevailing winds.

Included in this unit are small areas of Lisk, Macar, and Cabba soils. Also included are small areas of sandstone outcroppings. Included areas make up about 20 percent of the total acreage. These soils do not adversely affect the use and management of this unit as rangeland. The areas of sandstone outcroppings limit the range production of the unit.

The Dast soil is moderately deep and well drained. It formed in material derived from weakly consolidated, sandy sedimentary beds. Typically, the surface layer is brown fine sandy loam 3 inches thick. The underlying material to a depth of 25 inches is light gray and very pale brown fine sandy loam. Below this to a depth of 60 inches or more are pale yellow, weakly consolidated, sandy sedimentary beds. Sedimentary beds are at a depth of 20 to 40 inches.

Permeability is moderately rapid, and available water capacity is low. Effective rooting depth is limited by the sedimentary beds at a depth of 20 to 40 inches. Where this soil is under native vegetation, the average annual wetting depth is 20 to 32 inches. Runoff is slow to medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high. The soil is droughty.

The Blanchard soil is deep and excessively drained. It formed in sandy alluvial and eolian material. Typically, the surface layer is grayish brown loamy sand 7 inches thick. The upper 29 inches of the underlying material is grayish brown and light brownish gray loamy sand, and the lower part to a depth of 60 inches or more is light yellowish brown loamy coarse sand.

Permeability is rapid, and available water capacity is low. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 40 inches. Runoff is slow, and the hazard of water erosion is slight to moderate. The hazard of soil blowing is high. The soil is droughty.

These soils are used mainly as rangeland.

Cropland.—These soils are poorly suited to cultivated crops because of droughtiness, steepness of slope, and the high hazard of soil blowing.

Rangeland.—The potential native plant community on the Dast soil is mainly prairie sandreed, little bluestem, needleandthread, and thickspike wheatgrass. If the range is excessively grazed, the proportion of prairie sandreed and little bluestem decreases and the proportion of needleandthread, thickspike wheatgrass, perennial short grasses, threadleaf sedge, perennial forbs, and yucca increases. If excessive grazing continues, plants such as red threeawn, annuals, and weedlike forbs may invade. The potential native plant community produces about 1,800 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,000 pounds in years of below-normal precipitation.

The potential native plant community on the Blanchard soil is mainly sand bluestem, prairie sandreed, Indian ricegrass, little bluestem, and sun sedge. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, sand dropseed, perennial short grasses, threadleaf sedge, perennial forbs, and yucca increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 2,000 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,000 pounds in years of below-normal precipitation.

Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice on these soils. Conducting fieldwork on the contour or across the slope, where practical, reduces erosion and conserves moisture. Special precautions must be taken to reduce soil blowing until the plant cover is reestablished.

Windbreaks.—Areas of the Dast soil that have slopes of less than 15 percent and the Blanchard soil are suited to windbreaks, but the low available water capacity of the soils limits the growth of both trees and shrubs. Suitable trees for planting are Russian-olive, Siberian elm, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, western sandcherry, and skunkbush sumac. Areas of the Dast soil that have slopes of more than 15 percent are poorly suited to windbreaks.

Homesite development.—Areas of the Dast soil that have slopes of less than 15 percent are suited to homesite development. They have few limitations. In places, excavation for roads can expose material that is highly susceptible to soil blowing. Areas of the Dast soil that have slopes of more than 15 percent are poorly suited to homesite development.

The Blanchard soil is suited to homesite development. It is limited mainly by the rapid permeability and instability of the underlying material. Cutbanks are not stable and are subject to slumping, and effluent from septic tank absorption fields may contaminate ground water. In places, excavation for roads can expose material that is highly susceptible to soil blowing.

This map unit is in capability subclass VIe, nonirrigated. The Dast soil is in Sandy range site, 10- to 14-inch precipitation zone, and the Blanchard soil is in Sands range site, 10- to 14-inch precipitation zone.

56—Dimmick silty clay. This deep, very poorly drained, wet soil is in depressional areas and oxbows in the northern part of the county and in large, undrained lake basins in the west-central part. It formed in clayey alluvium. Slope is 0 to 1 percent. Slopes are mainly less than 1,000 feet long. Elevation is 1,900 to 2,600 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Harlem and Lohler soils. These included areas do not adversely affect the use and management of this unit as rangeland.

Typically, this Dimmick soil has a surface layer of gray silty clay 7 inches thick. The underlying material to a depth of 60 inches or more is gray and olive gray silty clay.

Permeability is very slow, and available water capacity is high. Effective rooting depth and the wetting depth are 60 inches or more. Runoff is ponded, and the hazard of water erosion is slight. The hazard of soil blowing is slight. This soil is subject to frequent periods of ponding during high intensity storms and spring runoff. It is also ponded by excess irrigation water runoff from surrounding fields. It has a water table from 1 foot above to 2 feet below the soil surface from April through September.

This soil is used as rangeland and wetland marsh.

Cropland.—This soil is not suited to cultivated crops because of wetness.

Rangeland.—The potential native plant community is mainly prairie cordgrass, tall sedges, western wheatgrass, and American sloughgrass. If the range is excessively grazed, the proportion of these plants decreases and the proportion of rushes and water plantain increases. If excessive grazing continues, plants such as curly dock and Baltic rush may invade. The potential native plant community produces about 6,000 pounds per acre of air-dry vegetation in years of above-normal precipitation and 5,000 pounds in years of below-normal precipitation.

Grazing should be delayed until the soil has drained sufficiently and is firm enough to withstand trampling by livestock. Except in fall, the use of mechanical renovation practices to improve forage production may be limited by wetness. Reestablishing plant cover is difficult.

Windbreaks.—This soil is not suited to windbreaks. It is limited mainly by wetness during the growing season.

Homesite development.—This soil is poorly suited to homesite development because of the hazard of frequent ponding and because of wetness.

This map unit is in capability subclass Vw, nonirrigated. It is in Wet Meadow range site, 10- to 14-inch precipitation zone.

57—Dimmick clay, drained. This deep soil is in large lake basins in the northeastern part of the county. It formed in clayey alluvium. Slope is 0 to 1 percent. Slopes are mainly less than 1,000 feet long. Elevation is 1,900 to 2,600 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Marvan and Pendroy soils. These areas do not adversely affect the use and management of this unit as rangeland and for nonirrigated farming.

Typically, this Dimmick soil has a surface layer of dark gray clay 7 inches thick. The underlying material to a depth of 60 inches or more is mostly dark gray clay.

Permeability is very slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is more than 60 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate. This soil has a water table at a depth of 1 foot to 3 feet from April to August. A system of surface drains has been installed to remove excess water. Rare periods of ponding may occur on this soil during high intensity storms and spring runoff.

This soil is used mainly for nonirrigated farming. It is also used as rangeland. The main nonirrigated crops are wheat, oats, and barley.

Cropland.—This soil is suited to cultivated crops. It is limited mainly by very slow permeability, rare periods of ponding, and the clayey texture of the surface layer. Seasonal ponding limits the production of crops. The soil is difficult to till when dry, and it is subject to clodding and compaction if it is tilled when wet. The content of soil moisture is optimum for tillage for only a short period. The addition of organic matter through stubble mulch tillage improves soil tilth.

Rangeland.—The potential native plant community is mainly western wheatgrass, green needlegrass, thickspike wheatgrass, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of Sandberg bluegrass, blue grama, and perennial forbs increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 2,000 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,400 pounds in years of below-normal precipitation.

Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Areas of deteriorated rangeland can be improved by mechanical treatment practices such as shallow chiseling and scalping.

Windbreaks.—This soil is suited to windbreaks. Suitable trees for planting are Russian-olive, black hawthorn, Siberian elm, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, common chokecherry, skunkbush sumac, and silver buffaloberry.

Homesite development.—This soil is poorly suited to homesite development because of the hazard of rare ponding and because of wetness.

This map unit is in capability subclass IVw, nonirrigated. It is in Clayey range site, 10- to 14-inch precipitation zone.

58—Ethridge silty clay loam, 0 to 4 percent slopes. This deep, well drained soil is on terraces and fans in the west-central part of the county. It formed in alluvium. Slopes are mainly more than 1,000 feet long. Elevation is 1,900 to 2,600 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Evanston, Creed, Lonna, and Yamac soils. The Yamac and Lonna soils are on fans and terraces. They are highly susceptible to soil blowing. The salt- and sodium-affected Creed soils are on terraces and the lower part of fans. The salts and sodium reduce the availability of moisture and plant nutrients and restrict the penetration of roots and moisture into the subsoil. These characteristics limit crop yields. The Evanston soils do not adversely affect the use and management of this unit as rangeland and for nonirrigated farming.

Typically, this Ethridge soil has a surface layer of grayish brown silty clay loam 3 inches thick. The upper 8 inches of the subsoil is dark grayish brown silty clay loam, and the lower 22 inches is light brownish gray silty clay loam. The substratum to a depth of 60 inches or more is light brownish gray silty clay.

Permeability is slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 24 inches. Runoff is slow to medium, and the hazard of water erosion is slight to moderate. The hazard of soil blowing is moderate. This soil is calcareous below a depth of 11 inches.

This soil is used as rangeland and for nonirrigated farming. The main nonirrigated crops are wheat, oats, and barley.

Cropland.—This soil is well suited to nonirrigated crops. It is limited mainly by the hazards of soil blowing and water erosion. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, stubble mulch tillage, and grassed waterways reduce soil blowing and water erosion.

Rangeland.—The potential native plant community is mainly western wheatgrass, green needlegrass, thickspike wheatgrass, and winterfat. If the range is excessively grazed, the proportion of these plants

decreases and the proportion of Sandberg bluegrass, blue grama, big sagebrush, and perennial forbs increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 2,000 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,200 pounds in years of below-normal precipitation.

The surface layer is susceptible to water erosion and soil blowing if it is disturbed or the range is overgrazed. Proper grazing use insures good plant vigor and adequate plant cover. Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Areas of deteriorated rangeland can be improved by mechanical treatment practices such as shallow chiseling and scalping. Control of sagebrush to reduce competition with desirable forage plants is a suitable practice.

Windbreaks.—This soil is well suited to windbreaks. Suitable trees for planting are Russian-olive, white willow, golden willow, Siberian elm, Siberian crabapple, black hawthorn, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and western sandcherry.

Homesite development.—This soil is poorly suited to homesite development. It is limited mainly by slow permeability, low soil strength, and shrink-swell potential. In the construction of basements or foundations for dwellings, the limitation of shrink-swell potential can be overcome by backfilling with suitable material that has low shrink-swell potential. If this soil is used for septic tank absorption fields, the limitation of slow permeability can be overcome by increasing the size of the absorption field or by excavating the trench to a suitable depth. The field or trench should be backfilled with gravel. Shrinking and swelling and low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations.

This map unit is in capability subclass IIIe, nonirrigated. It is in Clayey range site, 10- to 14-inch precipitation zone.

59—Ethridge silty clay loam, 4 to 8 percent slopes. This deep, well drained soil is on fans in the west-central part of the county. It formed in alluvium. Slopes are mainly 250 to more than 1,000 feet long. Elevation is 1,900 to 2,600 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Evanston, Creed, Lonna, and Yamac soils. The Lonna and Yamac soils are highly susceptible to soil blowing. The salt- and sodium-affected Creed soils are on the lower part of fans. The salts and sodium reduce the availability of moisture and plant nutrients and restrict the penetration of roots and moisture into the subsoil. These characteristics limit crop yields. The Evanston soils do not adversely affect the use and management of this unit as rangeland and for nonirrigated farming.

Typically, this Ethridge soil has a surface layer of grayish brown silty clay loam 3 inches thick. The upper 8 inches of the subsoil is dark grayish brown silty clay, and the lower 22 inches is light brownish gray silty clay loam. The substratum to a depth of 60 inches or more is light brownish gray silty clay.

Permeability is slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 24 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate. This soil is calcareous below a depth of 11 inches.

This soil is used as rangeland and for nonirrigated farming. The main nonirrigated crops are wheat, oats, and barley.

Cropland.—This soil is well suited to nonirrigated crops. It is limited mainly by the moderate hazards of soil blowing and water erosion. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, stubble mulch tillage, and grassed waterways reduce soil blowing and water erosion.

Rangeland.—The potential native plant community is mainly western wheatgrass, green needlegrass, thickspike wheatgrass, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of Sandberg bluegrass, blue grama, big sagebrush, and perennial forbs increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 2,000 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,200 pounds in years of below-normal precipitation.

The surface layer is susceptible to water erosion and soil blowing if it is disturbed or the range is overgrazed. Proper grazing use insures good plant vigor and adequate plant cover. Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Areas of deteriorated rangeland can be improved by mechanical treatment practices such as shallow chiseling and scalping. Control of sagebrush to reduce competition with desirable forage species is a suitable practice.

Windbreaks.—This soil is well suited to windbreaks. Suitable trees for planting are Russian-olive, white willow, golden willow, Siberian elm, Siberian crabapple, black hawthorn, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and western sandcherry.

Homesite development.—This soil is poorly suited to homesite development. It is limited mainly by slow permeability, low soil strength, and shrink-swell potential. In the construction of basements or foundations for dwellings, the limitation of shrink-swell potential can be overcome by backfilling with suitable material that has low shrink-swell potential. If this soil is used for septic tank absorption fields, the limitation of slow permeability can be overcome by increasing the size of the absorption field or by excavating the trench to a suitable depth. The field or trench should be backfilled with gravel. Shrinking and swelling and low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations.

This map unit is in capability subclass IIIe, nonirrigated. It is in Clayey range site, 10- to 14-inch precipitation zone.

60—Evanston loam, 0 to 2 percent slopes. This deep, well drained soil is on fans and terraces in the western part of the county. It formed in alluvium. Slopes are mainly more than 1,000 feet long. Elevation is 1,900 to 2,600 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Ethridge, Yamac, and Creed soils and soils that have a loamy surface layer and subsoil and have a gravelly substratum at a depth of 20 to 40 inches. The soils that have a gravelly substratum are droughty and are low in productivity. The Creed soils are in shallow depressional areas on fans and terraces. They are moderately affected by sodium below a depth of about 8 inches, which limits yields by restricting the penetration of roots and moisture and reducing the amount of moisture available to plants. The Ethridge and Yamac soils do not adversely affect the use and management of this unit as rangeland and for nonirrigated farming.

Typically, this Evanston soil has a surface layer of dark grayish brown loam 8 inches thick. The subsoil is dark grayish brown and grayish brown clay loam 18 inches thick. The substratum to a depth of 60 inches or more is light brownish gray clay loam.

Permeability is moderate, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 24 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

This soil is used mainly as rangeland and for nonirrigated farming. The main nonirrigated crops are wheat, oats, and barley.

Cropland.—This soil is well suited to nonirrigated crops. It is limited mainly by the hazard of soil blowing. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, and stubble mulch tillage reduce soil blowing.

Rangeland.—The potential native plant community is mainly western wheatgrass, green needlegrass, little bluestem, bluebunch wheatgrass, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, perennial short grasses, threadleaf sedge, fringed sagewort, silver sagebrush, and perennial forbs increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,800 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,200 pounds in years of below-normal precipitation.

Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Areas of deteriorated rangeland can be improved by mechanical treatment practices such as shallow chiseling or scalping.

Windbreaks.—This soil is well suited to windbreaks. Suitable trees for planting are Russian-olive, white willow, golden willow, Siberian elm, Siberian crabapple, black hawthorn, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and western sandcherry.

Homesite development.—This soil is suited to homesite development. It is limited mainly by shrink-swell potential, low soil strength, and moderate permeability. If this soil is used for septic tank absorption fields, the limitation of moderate permeability can be overcome by increasing the size of the absorption field or by excavating the trench to a suitable depth. The field or trench should be backfilled with gravel. In the construction of basements or foundations for dwellings, the limitation of shrink-swell potential can be overcome by backfilling with suitable material that has low shrink-swell potential. Shrinking and swelling and low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations.

This map unit is in capability subclass IIIe, nonirrigated. It is in Silty range site, 10- to 14-inch precipitation zone.

61—Evanston loam, 2 to 8 percent slopes. This deep, well drained soil is on fans in the western part of the county. It formed in alluvium. Slopes are mainly more than 1,000 feet long. Elevation is 1,900 to 2,600 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Ethridge, Yamac, and Creed soils and soils that have a loamy surface layer and subsoil and have a gravelly substratum

at a depth of 20 to 40 inches. The soils that have a gravelly substratum are droughty and are low in productivity. The Creed soils are in shallow depressional areas on fans. They are moderately affected by sodium below a depth of about 8 inches, which limits yields by restricting the penetration of roots and moisture and reducing the amount of moisture available to plants. The Ethridge and Yamac soils do not adversely affect the use and management of this unit as rangeland and for nonirrigated farming.

Typically, this Evanston soil has a surface layer of dark grayish brown loam 8 inches thick. The subsoil is dark grayish brown and grayish brown clay loam 18 inches thick. The substratum to a depth of 60 inches or more is light brownish gray clay loam.

Permeability is moderate, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 24 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

This soil is used mainly as rangeland and for nonirrigated farming. The main nonirrigated crops are wheat, oats, and barley.

Cropland.—This soil is well suited to nonirrigated crops. It is limited mainly by the hazards of water erosion and soil blowing. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, stubble mulch tillage, and grassed waterways reduce soil blowing and water erosion.

Rangeland.—The potential native plant community is mainly western wheatgrass, green needlegrass, little bluestem, bluebunch wheatgrass, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, perennial short grasses, threadleaf sedge, fringed sagewort, silver sagebrush, and perennial forbs increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,800 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,200 pounds in years of below-normal precipitation.

The surface layer is susceptible to water erosion and soil blowing if it is disturbed or the range is overgrazed. Proper grazing use insures good plant vigor and adequate plant cover. Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Areas of deteriorated rangeland can be improved by mechanical treatment practices such as shallow chiseling and scalping.

Windbreaks.—This soil is well suited to windbreaks. Suitable trees for planting are Russian-olive, white willow, golden willow, Siberian elm, Siberian crabapple, black hawthorn, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and western sandcherry.

Homesite development.—This soil is suited to homesite development. It is limited mainly by shrink-swell potential, low soil strength, and moderate permeability. If this soil is used for septic tank absorption fields, the limitation of moderate permeability can be overcome by increasing the size of the absorption field or by excavating the trench to a suitable depth. The field or trench should be backfilled with gravel. In the construction of basements or foundations for dwellings, the limitation of shrink-swell potential can be overcome by backfilling with suitable material that has low shrink-swell potential. Shrinking and swelling and low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations.

This map unit is in capability subclass IIIe, nonirrigated. It is in Silty range site, 10- to 14-inch precipitation zone.

62—Evanston-Gerdrum complex, 2 to 8 percent slopes. This map unit is on fans and terraces in the western part of the county. Slopes are mainly 250 to 1,000 feet long. Elevation is 1,900 to 2,600 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

This unit is about 60 percent Evanston loam and about 25 percent Gerdrum clay loam. The Gerdrum soil is in small, shallow depressional areas surrounded by the Evanston soil.

Included in this unit are small areas of Kremlin, Yamac, and Creed soils. Included areas make up about 15 percent of the total acreage. These areas do not adversely affect the use and management of this unit as rangeland and for nonirrigated farming.

The Evanston soil is deep and well drained. It formed in alluvium. The surface layer is dark grayish brown loam 8 inches thick. The subsoil is dark grayish brown and grayish brown clay loam 18 inches thick. The substratum to a depth of 60 inches or more is light brownish gray clay loam.

Permeability is moderate, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 24 inches. Runoff is medium, and the hazard of water erosion is moderate.

The Gerdrum soil is deep and well drained and is affected by salts and sodium. It formed in alluvium. Typically, the surface layer, where mixed to a depth of 7 inches, is light brownish gray clay loam. The upper 4 inches of the subsoil is light brownish gray clay, and the lower 9 inches is light brownish gray clay loam. The substratum to a depth of 60 inches or more is mostly light brownish gray clay loam.

Permeability is slow, and available water capacity is moderate. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 24 inches. Runoff is slow to medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate. This soil is strongly salt-affected and moderately sodium-affected at a depth of about 7 inches.

Most areas of these soils are used as rangeland. A few areas are used for nonirrigated farming. The main nonirrigated crops are wheat, oats, and barley.

Cropland.—These soils are suited to nonirrigated crops. They are limited by the content of salts and sodium in the subsoil of the Gerdrum soil and the hazards of water erosion and soil blowing. Subsoiling improves water infiltration and allows salts to be leached downward. Minimum tillage, contour cultivation, stripcropping, tall grass barriers, grassed waterways, and return of crop residue to the soil reduce soil blowing and water erosion. Tall grass barriers also reduce evaporation and trap snow, which increases the amount of moisture in the soil. Return of crop residue also helps to maintain good soil tilth. Chiseling stubble fields in fall on the contour or across the slope reduces runoff and water erosion.

Rangeland.—The potential native plant community on the Evanston soil is mainly western wheatgrass, green needlegrass, little bluestem, bluebunch wheatgrass, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, perennial short grasses, threadleaf sedge, fringed sagewort, silver sagebrush, and perennial forbs increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,800 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,200 pounds in years of below-normal precipitation.

The potential native plant community on the Gerdrum soil is mainly western wheatgrass, green needlegrass, thickspike wheatgrass, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, blue grama, Sandberg bluegrass, big sagebrush, and perennial forbs increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,200 pounds per acre of air-dry vegetation in years of above-normal precipitation and 500 pounds in years of below-normal precipitation.

The surface layer of these soils is susceptible to water erosion and soil blowing if it is disturbed or the range is overgrazed. Proper grazing use insures good plant vigor and adequate plant cover. Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Areas of deteriorated rangeland can be improved by mechanical treatment practices such as shallow chiseling and scalping.

Windbreaks.—The Evanston soil is well suited to windbreaks. Suitable trees for planting are Russian-olive, white willow, golden willow, Siberian elm, Siberian crabapple, black hawthorn, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and western sandcherry.

The Gerdrum soil is poorly suited to windbreaks. It is strongly salt-affected, which limits the choice of trees and shrubs to Russian-olive and silver buffaloberry.

Homesite development.—These soils are poorly suited to homesite development. They are limited mainly by slow and moderate permeability, shrink-swell potential, and low soil strength. If buildings are constructed on these soils, properly designing foundations and footings and diverting runoff away from buildings help to prevent structural damage as a result of shrinking and swelling. If these soils are used for septic tank absorption fields, the limitation of slow or moderate permeability can be overcome by increasing the size of the absorption field or by excavating the trench to a suitable depth. The field or trench should be backfilled with gravel. Shrinking and swelling and low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations.

This map unit is in capability subclass IVe, nonirrigated. The Evanston soil is in Silty range site, 10- to 14-inch precipitation zone, and the Gerdrum soil is in Clay Pan range site, 10- to 14-inch precipitation zone.

63—Farland silt loam, 0 to 4 percent slopes. This deep, well drained soil is on fans and terraces in the eastern part of the county. It formed in alluvium. Slopes are mainly more than 1,000 feet long. Elevation is 1,900 to 3,400 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Farnuf, Savage, Bryant, Cherry, and Cambert soils. The Cherry soils are highly susceptible to soil blowing. The Farnuf, Savage, Bryant, and Cambert soils do not adversely affect the use and management of this unit for nonirrigated farming or as rangeland.

Typically, this Farland soil has a surface layer of grayish brown and dark grayish brown silt loam 4 inches thick. The upper 11 inches of the subsoil is dark grayish brown silty clay loam, and the lower 15 inches is grayish brown silt loam. The substratum to a depth of 60 inches or more is light gray silt loam.

Permeability is moderate, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 30 inches. Runoff is slow,

and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

Most areas of this soil are used for nonirrigated farming. A few areas are used as rangeland. The main nonirrigated crops are wheat, oats, and barley. If this soil is irrigated, it is prime farmland.

Cropland.—This soil is well suited to nonirrigated crops. It is limited mainly by the moderate hazard of soil blowing. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, and stubble mulch tillage reduce soil blowing.

Rangeland.—The potential native plant community is mainly western wheatgrass, green needlegrass, little bluestem, bluebunch wheatgrass, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, perennial short grasses, threadleaf sedge, and fringed sagewort increases. If excessive grazing continues, plants such as annuals, weedlike forbs, and Kentucky bluegrass may invade. The potential native plant community produces about 2,000 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,200 pounds in years of below-normal precipitation.

Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Areas of deteriorated rangeland can be improved by mechanical treatment practices such as shallow chiseling and scalping.

Windbreaks.—This soil is well suited to windbreaks. Suitable trees for planting are Russian-olive, white willow, golden willow, Siberian elm, Siberian crabapple, black hawthorn, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and western sandcherry.

Homesite development.—This soil is poorly suited to homesite development. It is limited mainly by moderate permeability, shrink-swell potential, and low soil strength. If buildings are constructed on this soil, properly designing foundations and footings and diverting runoff away from buildings help to prevent structural damage as a result of shrinking and swelling. If this soil is used for septic tank absorption fields, the limitation of moderate permeability can be overcome by increasing the size of the absorption field or by excavating the trench to a suitable depth. The field or trench should be backfilled with gravel. Shrinking and swelling and low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations.

This map unit is in capability subclass IIIe, nonirrigated. It is in Silty range site, 10- to 14-inch precipitation zone.

64—Farnuf loam, 0 to 4 percent slopes. This deep, well drained soil is is on fans and terraces in the eastern part of the county. It formed in alluvium. Slopes are mainly more than 1,000 feet long. Elevation is 1,900 to 3,400 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Farland, Williams, Savage, Cambert, and Shambo soils. These areas do not adversely affect the use and management of this unit for nonirrigated crops and as rangeland.

Typically, this Farnuf soil has a surface layer of dark grayish brown loam 6 inches thick. The upper 9 inches of the subsoil is dark grayish brown clay loam, and the lower 9 inches is brown clay loam. The substratum to a depth of 60 inches or more is pale yellow and light yellowish brown loam.

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

Most areas of this soil are used for nonirrigated crops. A few areas are used as rangeland. The main nonirrigated crops are wheat, oats, and barley. If this soil is irrigated, it is prime farmland.

Cropland.—This soil is well suited to nonirrigated crops. It is limited mainly by the hazard of soil blowing. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, and stubble mulch tillage reduce soil blowing.

Rangeland.—The potential native plant community is mainly western wheatgrass, green needlegrass, bluebunch wheatgrass, little bluestem, plains muhly, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, blue grama, fringed sagewort, and perennial forbs increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 2,000 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,200 pounds in years of below-normal precipitation.

Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Areas of deteriorated rangeland can be improved by mechanical treatment practices such as shallow chiseling and scalping.

Windbreaks.—This soil is well suited to windbreaks. Suitable trees for planting are Russian-olive, white willow, golden willow, Siberian elm, Siberian crabapple, black hawthorn, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and western sandcherry.

Homesite development.—This soil is poorly suited to homesite development. It is limited mainly by moderate permeability, low soil strength, and the potential for

shrinking and swelling. Buildings can be designed to offset the effects of shrinking and swelling. If this soil is used for septic tank absorption fields, the limitation of moderate permeability can be overcome by increasing the size of the absorption field or by excavating the trench to a suitable depth. The field or trench should be backfilled with gravel. Shrinking and swelling and low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations.

This map unit is in capability subclass IIIe, nonirrigated. It is in Silty range site, 10- to 14-inch precipitation zone.

65—Floweree silt loam, 0 to 4 percent slopes. This deep, well drained soil is on fans and terraces in the west-central and southwestern parts of the county. It formed in alluvium. Slopes are mainly more than 1,000 feet long. Elevation is 1,900 to 2,600 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Cambeth, Lonna, Kremlin, and Ethridge soils. The deep, well drained Lonna soils are on terraces. They are highly susceptible to soil blowing. The Cambeth, Kremlin, and Ethridge soils do not adversely affect the use and management of this unit as rangeland and for nonirrigated farming.

Typically, this Floweree soil has a surface layer of grayish brown silt loam 2 inches thick. The subsoil is grayish brown and light brownish gray silt loam 13 inches thick. The upper 22 inches of the substratum is light brownish gray silt loam, and the lower part to a depth of 60 inches or more is grayish brown silty clay loam.

Permeability is moderately slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 24 inches. Runoff is slow, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate. This soil is calcareous below a depth of 10 inches.

This soil is used for nonirrigated farming and as rangeland. The main nonirrigated crops are wheat, oats, and barley.

Cropland.—This soil is well suited to nonirrigated crops. It is limited mainly by the moderate hazards of soil blowing and water erosion. Minimum tillage, contour cultivation, grassed waterways, and stubble mulch tillage reduce soil blowing and water erosion.

Rangeland.—The potential native plant community is mainly western wheatgrass, green needlegrass, little bluestem, bluebunch wheatgrass, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, perennial short grasses, threadleaf sedge, fringed sagewort, silver sagebrush, and perennial forbs increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,800 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,200 pounds in years of below-normal precipitation.

The surface layer is susceptible to water erosion and soil blowing if it is disturbed or the range is overgrazed. Proper grazing use insures good plant vigor and adequate plant cover. Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Areas of deteriorated rangeland can be improved by mechanical treatment practices such as shallow chiseling and scalping.

Windbreaks.—This soil is well suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian elm, white willow, golden willow, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, skunkbush sumac, and silver buffaloberry.

Homesite development.—This soil is poorly suited to homesite development. It is limited mainly by moderately slow permeability, low soil strength, and shrink-swell potential. Buildings can be designed to offset the effects of shrinking and swelling. If this soil is used for septic tank absorption fields, the limitation of moderately slow permeability can be overcome by increasing the size of the absorption field or by excavating the trench to a suitable depth. The field or trench should be backfilled with gravel. Shrinking and swelling and low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations.

This map unit is in capability subclass IIIe, nonirrigated. It is in Silty range site, 10- to 14-inch precipitation zone.

66—Floweree silt loam, 4 to 8 percent slopes. This deep, well drained soil is on fans in the west-central and southwestern parts of the county. It formed in alluvium. Slopes are mainly 250 to 1,000 feet long. Elevation is 1,900 to 2,600 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Cambeth, Yamac, Kremlin, and Chinook soils. The deep, well drained Yamac and Chinook soils are on fans. These soils are highly susceptible to soil blowing. The Cambeth and Kremlin soils do not adversely affect the use and management of this unit as rangeland and for nonirrigated farming.

Typically, this Floweree soil has a surface layer of grayish brown silt loam 2 inches thick. The subsoil is mostly light brownish gray silt loam 13 inches thick. The upper 22 inches of the substratum is light brownish gray

silt loam, and the lower part to a depth of 60 inches or more is grayish brown silty clay loam.

Permeability is moderately slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 24 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate. This soil is calcareous below a depth of 10 inches.

This soil is used for nonirrigated farming and as rangeland. The main nonirrigated crops are wheat, oats, and barley.

Cropland.—This soil is well suited to nonirrigated crops. It is limited mainly by the moderate hazards of soil blowing and water erosion. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, stubble mulch tillage, and grassed waterways reduce soil blowing and water erosion.

Rangeland.—The potential native plant community is mainly western wheatgrass, green needlegrass, little bluestem, bluebunch wheatgrass, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, perennial short grasses, threadleaf sedge, fringed sagewort, silver sagebrush, and perennial forbs increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,800 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,200 pounds in years of below-normal precipitation.

The surface layer is susceptible to water erosion and soil blowing if it is disturbed or the range is overgrazed. Proper grazing use insures good plant vigor and adequate plant cover. Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Areas of deteriorated rangeland can be improved by mechanical treatment practices such as shallow chiseling and scalping.

Windbreaks.—This soil is well suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian elm, white willow, golden willow, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, skunkbush sumac, and silver buffaloberry.

Homesite development.—This soil is poorly suited to homesite development. It is limited mainly by moderately slow permeability, low soil strength, and shrink-swell potential. Buildings can be designed to offset the effects of shrinking and swelling. If this soil used for septic tank absorption fields, the limitation of moderately slow permeability can be overcome by increasing the size of the absorption field or by excavating the trench to a suitable depth. The field or trench should be backfilled with gravel. Shrinking and swelling and low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations.

This map unit is in capability subclass IIIe, nonirrigated. It is in Silty range site, 10- to 14-inch precipitation zone.

67—Floweree-Cambeth silt loams, 2 to 8 percent slopes. This map unit is on uplands in the southwestern and west-central parts of the county. Slopes are mainly 250 to 1,000 feet long. Elevation is 1,900 to 2,600 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

This unit is about 50 percent Floweree silt loam and 40 percent Cambeth silt loam. The Floweree soil is in swales and on fans and foot slopes. The Cambeth soil is on the foot slopes, sides, and tops of hills and on ridges.

Included in this unit are small areas of Busby, Yamac, Cabbart, and Yawdim soils. Included areas make up about 10 percent of the total acreage. The shallow, well drained Cabbart and Yawdim soils are on the tops of hills and ridges. They are droughty and are low in productivity. The Busby and Yamac soils are highly susceptible to soil blowing.

The Floweree soil is deep and well drained. It formed in alluvium. Typically, the surface layer is grayish brown silt loam 2 inches thick. The subsoil is mostly light brownish gray silt loam 13 inches thick. The upper 22 inches of the substratum is light brownish gray silt loam, and the lower part to a depth of 60 inches or more is grayish brown silty clay loam.

Permeability is moderately slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 24 inches. Runoff is medium, and the hazard of water erosion is moderate. This soil is calcareous below a depth of 10 inches.

The Cambeth soil is moderately deep and well drained. It formed in material derived dominantly from weakly consolidated, silty sedimentary beds. Typically, the surface layer is brown silt loam 6 inches thick. The subsoil is mostly light yellowish brown silt loam 7 inches thick. The substratum to a depth of 35 inches is pale yellow silt loam. Below this to a depth of 60 inches or more are white, weakly consolidated, silty sedimentary beds. Sedimentary beds are at a depth of 20 to 40 inches.

Permeability is moderate, and available water capacity is moderate. Effective rooting depth is limited by the sedimentary beds at a depth of 20 to 40 inches. Where this soil is under native vegetation, the average annual wetting depth is 20 to 24 inches. Runoff is slow to medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate. This soil is calcareous below a depth of 6 inches.

These soils are used as rangeland and for nonirrigated farming. The main nonirrigated crops are wheat, oats, and barley.

Cropland.—These soils are well suited to nonirrigated crops. They are limited mainly by the moderate hazards of soil blowing and water erosion. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, stubble mulch tillage, and grassed waterways reduce soil blowing and water erosion.

Rangeland.—The potential native plant community is mainly western wheatgrass, green needlegrass, little bluestem, bluebunch wheatgrass, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, perennial short grasses, threadleaf sedge, fringed sagewort, silver sagebrush, and perennial forbs increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community on the Floweree soil produces about 1,800 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,200 pounds in years of below-normal precipitation. On the Cambeth soil, the production is 1,600 pounds per acre in years of above-normal precipitation and 1,000 pounds in years of below-normal precipitation.

The surface layer of these soils is susceptible to water erosion and soil blowing if it is disturbed or the range is overgrazed. Proper grazing use insures good plant vigor and adequate plant cover. Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Areas of deteriorated rangeland can be improved by mechanical treatment practices such as shallow chiseling and scalping.

Windbreaks.—The Floweree soil is well suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian elm, white willow, golden willow, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, skunkbush sumac, and silver buffaloberry.

The Cambeth soil is suited to windbreaks, but the limited moisture supply restricts the choice of trees and shrubs. Suitable trees for planting are Russian-olive, Siberian elm, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, and skunkbush sumac.

Homesite development.—These soils are poorly suited to homesite development. The Floweree soil is limited by moderately slow permeability, low soil strength, and shrink-swell potential. Buildings can be designed to offset the effects of shrinking and swelling. If this soil is used for septic tank absorption fields, the limitation of moderately slow permeability can be overcome by increasing the size of the absorption field or by excavating the trench to a suitable depth. The field or trench should be backfilled with gravel. Shrinking and swelling and low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations.

The Cambeth soil is limited mainly by the slow permeability of the underlying sedimentary beds, shrink-swell potential, and low soil strength. In the construction of basements or foundations for dwellings, the limitation of shrink-swell potential can be overcome by backfilling with suitable material that has low shrink-swell potential. This soil is poorly suited to septic tank absorption fields because of the slow permeability of the underlying sedimentary beds. Shrinking and swelling and low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations.

This map unit is in capability subclass IIIe, nonirrigated. It is in Silty range site, 10- to 14-inch precipitation zone.

68—Gerdrum clay loam, 0 to 8 percent slopes. This deep, well drained, salt- and sodium-affected soil is on fans and terraces in the western and northern parts of the county. It formed in alluvium. Slopes are mainly 250 to 1,000 feet long. Elevation is 1,900 to 2,600 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Absher, Rominell, Creed, Yawdim, Adger, and Kremlin soils. The Absher soils are in small, shallow, barren depressional areas. These soils are moderately salt-affected and strongly sodium-affected and have a thin surface crust. These factors severely limit the emergence of seedlings and the penetration of roots and moisture. The Yawdim soils are on the sides and tops of ridges and hills. They are underlain by semiconsolidated shale at a depth of 10 to 20 inches and are droughty. The Adger soils are strongly salt- and sodium-affected. All of these soils are low in productivity. The Rominell, Creed, and Kremlin soils do not adversely affect the use and management of this unit as rangeland and for nonirrigated farming.

Typically, this Gerdrum soil, where mixed to a depth of 7 inches, has a surface layer of light brownish gray clay loam. The upper 4 inches of the subsoil is light brownish gray clay, and the lower 9 inches is light brownish gray clay loam. The substratum to a depth of 60 inches or more is light brownish gray and pale olive clay loam.

Permeability is slow, and available water capacity is moderate. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 24 inches. Runoff is slow to medium, and the hazard of water erosion is slight to moderate. The hazard of soil blowing is moderate. This soil is strongly salt-affected and moderately sodium-affected at a depth of about 7 inches.

Most areas of this soil are used as rangeland. A few areas are used for nonirrigated farming. The main nonirrigated crops are wheat, oats, and barley.

Cropland.—If this soil is used for nonirrigated crops, it is limited by the content of salts and sodium, the hard

crust that forms on the surface following rainfall, and the hazards of soil blowing and water erosion. The salts and sodium reduce the availability of moisture and plant nutrients and restrict the penetration of roots into the subsoil. The hard surface crust reduces the percentage of seedlings that emerge. These factors limit crop yields. Returning crop residue to the soil or regularly adding other organic matter improves fertility, reduces crusting, and increases the water intake rate.

Minimum tillage, contour cultivation, stripcropping, tall grass barriers, grassed waterways, and return of crop residue to the soil reduce soil blowing and water erosion. Tall grass barriers also reduce evaporation and trap snow, which increases the amount of moisture in the soil. Return of crop residue also helps to maintain good soil tilth. Chiseling stubble fields in fall on the contour or across the slope reduces runoff and water erosion.

Rangeland.—The potential native plant community is mainly western wheatgrass, green needlegrass, thickspike wheatgrass, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, blue grama, Sandberg bluegrass, big sagebrush, fringed sagewort, and perennial forbs increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,200 pounds per acre of air-dry vegetation in years of above-normal precipitation and 500 pounds in years of below-normal precipitation.

Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Areas of deteriorated rangeland can be improved by mechanical treatment practices such as shallow chiseling, scalping, contour furrowing, and subsoiling. Control of big sagebrush to reduce competition with desirable forage species is a suitable practice.

Windbreaks.—This soil is poorly suited to windbreaks. It is salt-affected, which limits the choice of trees and shrubs to Russian-olive and silver buffaloberry.

Homesite development.—This soil is poorly suited to homesite development. It is limited mainly by slow permeability, shrink-swell potential, and low soil strength. In the construction of basements or foundations for dwellings, the limitation of shrink-swell potential can be overcome by backfilling with suitable material that has low shrink-swell potential. If this soil is used for septic tank absorption fields, the limitation of slow permeability can be overcome by increasing the size of the absorption field or by excavating the trench to a suitable depth. The field or trench should be backfilled with gravel. Shrinking and swelling and low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations.

This map unit is in capability subclass IVe, nonirrigated. It is in Clay Pan range site, 10- to 14-inch precipitation zone.

69—Gerdrum clay loam, gullied, 8 to 15 percent slopes. This deep, well drained, salt- and sodium-affected soil is on fans in the western part of the county. It commonly is frequently dissected by gullies that are 2 to 10 feet deep, as much as 5 feet wide, and 100 to 500 feet apart. They are caused by the concentrated flow of water that runs in from adjacent higher-lying areas. The soil formed in alluvium. Slopes are mainly less than 1,000 feet long. Elevation is 1,900 to 2,600 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Yamac, Chinook, and Absher soils and shale outcroppings. The areas of soil do not adversely affect the use and management of this unit as rangeland. The areas of shale outcroppings limit the range production of the unit.

Typically, this Gerdrum soil, where mixed to a depth of 7 inches, has a surface layer of light brownish gray clay loam. The upper 4 inches of the subsoil is light brownish gray clay, and the lower 9 inches is light brownish gray clay loam. The substratum to a depth of 60 inches or more is mostly light brownish gray clay loam.

Permeability is slow, and available water capacity is moderate. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 24 inches. Runoff is medium, and the hazard of water erosion is high. The hazard of soil blowing is moderate. This soil is strongly salt-affected and moderately sodium-affected at a depth of about 7 inches.

This soil is used as rangeland.

Cropland.—This soil is poorly suited to cultivated crops because the many deep, narrow gullies make tillage difficult.

Rangeland.—The potential native plant community is mainly western wheatgrass, green needlegrass, thickspike wheatgrass, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, blue grama, Sandberg bluegrass, big sagebrush, and perennial forbs increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,000 pounds per acre of air-dry vegetation in years of above-normal precipitation and 500 pounds in years of below-normal precipitation.

The surface layer is susceptible to water erosion and soil blowing if it is disturbed or the range is overgrazed. Proper grazing use insures good plant vigor and adequate plant cover. The many gullies make seeding and mechanical treatment difficult.

Windbreaks.—This soil is poorly suited to windbreaks. It is salt-affected, which limits the choice of trees and shrubs to Russian-olive and silver buffaloberry.

Homesite development.—This soil is poorly suited to homesite development. It is limited mainly by slow permeability, shrink-swell potential, low soil strength, and the many gullies that limit access. In the construction of basements or foundations for dwellings, the limitation of shrink-swell potential can be overcome by backfilling with suitable material that has low shrink-swell potential. If this soil is used for septic tank absorption fields, the limitation of slow permeability can be overcome by increasing the size of the absorption field or by excavating the trench to a suitable depth. The field or trench should be backfilled with gravel. Shrinking and swelling and low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations.

This map unit is in capability subclass VIe, nonirrigated. It is in Clay Pan range site, 10- to 14-inch precipitation zone.

70—Gerdrum-Absher clay loams, 0 to 8 percent slopes. This map unit is on fans and terraces in the western and northern parts of the county. Slopes are mainly less than 1,000 feet long. Elevation is 1,900 to 2,600 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

This unit is about 40 percent Gerdrum clay loam and 40 percent Absher clay loam. The Absher soil is in small depressional areas surrounded by the Gerdrum soil.

Included in this unit are small areas of Weingart, Rominell, Yawdim, and Fleak soils. Included areas make up about 20 percent of the total acreage. These areas do not adversely affect the use and management of this unit as rangeland.

The Gerdrum soil is deep and well drained and is salt- and sodium-affected. It formed in alluvium. Typically, the surface layer, where mixed to a depth of 7 inches, is light brownish gray clay loam. The upper 4 inches of the subsoil is light brownish gray clay, and the lower 9 inches is light brownish gray clay loam. The substratum to a depth of 60 inches or more is mostly light brownish gray clay loam.

Permeability is slow, and available water capacity is moderate. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 24 inches. Runoff is medium, and the hazard of water erosion is high. The hazard of soil blowing is moderate. This soil is strongly salt-affected and moderately sodium-affected at a depth of about 7 inches.

The Absher soil is deep and well drained and is moderately salt-affected and strongly sodium-affected. It formed in alluvium. Typically, the surface layer, where mixed to a depth of 7 inches, is grayish brown clay loam. A thin crust is on the surface. The subsoil is mostly light brownish gray clay loam and clay 20 inches thick. The substratum to a depth of 60 inches or more is mostly light brownish gray clay loam.

Permeability is very slow, and available water capacity is moderate. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 20 inches. Runoff is slow to medium, and the hazard of water erosion is slight to moderate. The hazard of soil blowing is moderate. This soil is moderately salt-affected and strongly sodium-affected at a depth of about 5 inches.

These soils are used as rangeland.

Cropland.—These soils are poorly suited to cultivated crops because of the content of salts and sodium in the subsoil. The salts and sodium reduce the availability of moisture and plant nutrients and restrict the penetration of roots and moisture into the subsoil. These characteristics drastically limit crop yields.

Rangeland.—The potential native plant community on the Gerdrum soil is mainly western wheatgrass, green needlegrass, thickspike wheatgrass, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, blue grama, Sandberg bluegrass, big sagebrush, and perennial forbs increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,200 pounds per acre of air-dry vegetation in years of above-normal precipitation and 500 pounds in years of below-normal precipitation.

The potential native plant community on the Absher soil is mainly western wheatgrass, green needlegrass, Montana wheatgrass, winterfat, and Nuttall saltbush. If the range is excessively grazed, the proportion of these plants decreases and the proportion of blue grama, Sandberg bluegrass, other perennial short grasses, perennial forbs, and big sagebrush increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 600 pounds per acre of air-dry vegetation in years of above-normal precipitation and 400 pounds in years of below-normal precipitation.

Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Areas of deteriorated rangeland can be improved by mechanical treatment practices such as contour furrowing and scalping.

Windbreaks.—These soils are poorly suited to windbreaks. They are salt-affected, which limits the choice of trees and shrubs to Russian-olive and silver buffaloberry.

Homesite development.—These soils are poorly suited to homesite development. They are limited mainly by slow and very slow permeability, shrink-swell potential,

and low soil strength. In the construction of basements or foundations for dwellings, the limitation of shrink-swell potential can be overcome by backfilling with suitable material that has low shrink-swell potential. If these soils are used for septic tank absorption fields, the limitation of slow and very slow permeability can be overcome by increasing the size of the absorption field or by excavating the trench to a suitable depth. The field or trench should be backfilled with gravel. Shrinking and swelling and low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations.

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

71—Gerdrum-Yawdim-Fleak complex, 0 to 8 percent slopes. This map unit is on uplands in the western part of the county. Slopes are mainly less than 1,000 feet long. Elevation is 1,900 to 2,600 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

This unit is about 30 percent Gerdrum clay loam, 25 percent Yawdim silty clay, and 20 percent Fleak loamy sand. The nearly level to gently sloping Gerdrum soil is on fans between the gently sloping to moderately sloping Yawdim and Fleak soils on low hills.

Included in this unit are small areas of Absher, Neldore, Busby, and Yamac soils. Also included are small areas of shale and sandstone outcroppings and soils that have slopes of more than 8 percent. Included areas make up about 25 percent of the total acreage. The areas of soil do not adversely affect the use and management of this unit as rangeland. The areas of shale and sandstone outcroppings limit the range production on the unit.

The Gerdrum soil is deep, well drained, and salt- and sodium-affected. It formed in alluvium. Typically, the surface layer, where mixed to a depth of 7 inches, is light brownish gray clay loam. The upper 4 inches of the subsoil is light brownish gray clay, and the lower 9 inches is light brownish gray clay loam. The substratum to a depth of 60 inches or more is mostly light brownish gray clay loam.

Permeability is slow, and available water capacity is moderate. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 24 inches. Runoff is slow to medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate. This soil is strongly salt-affected and moderately sodium-affected at a depth of about 7 inches.

The Yawdim soil is shallow and well drained. It formed in material derived from semiconsolidated shale. Typically, the surface layer is grayish brown silty clay 6 inches thick. The underlying material to a depth of 15 inches is light olive gray silty clay. Below this to a depth of 60 inches or more is light olive gray semiconsolidated shale. Semiconsolidated shale is at a depth of 10 to 20 inches.

Permeability is slow, and available water capacity is very low. Effective rooting depth is limited by the semiconsolidated shale at a depth of 10 to 20 inches. Where this soil is under native vegetation, the average annual wetting depth is 10 to 20 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high. The soil is droughty.

The Fleak soil is shallow and somewhat excessively drained. It formed in material derived from weakly consolidated, sandy sedimentary beds. Typically, the surface layer, where mixed to a depth of 7 inches, is olive brown loamy sand. The underlying material to a depth of 16 inches is olive loamy sand. Below this to a depth of 60 inches or more are mostly light olive brown, weakly consolidated, sandy sedimentary beds. Sedimentary beds are at a depth of 10 to 20 inches.

Permeability is rapid, and available water capacity is very low. Effective rooting depth is limited by the sedimentary beds at a depth of 10 to 20 inches. Where this soil is under native vegetation, the average annual wetting depth is 10 to 20 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high. The soil is droughty.

These soils are used as rangeland.

Cropland.—These soils are poorly suited to cultivated crops because of the hazards of soil blowing and water erosion, the shallow depth and droughtiness of the Yawdim and Fleak soils, and the content of salts and sodium in the Gerdrum soil.

Rangeland.—The potential native plant community on the Gerdrum soil is mainly western wheatgrass, green needlegrass, thickspike wheatgrass, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, blue grama, Sandberg bluegrass, and big sagebrush increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,200 pounds per acre of air-dry vegetation in years of above-normal precipitation and 500 pounds in years of below-normal precipitation.

The potential native plant community on the Yawdim soil is mainly western wheatgrass, green needlegrass, thickspike wheatgrass, and Nuttall saltbush. If the range is excessively grazed, the proportion of these plants decreases and the proportion of Sandberg bluegrass, blue grama, big sagebrush, perennial forbs, and rabbitbrush increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade.

The potential native plant community produces about 1,000 pounds per acre of air-dry vegetation in years of above-normal precipitation and 600 pounds in years of below-normal precipitation.

The potential native plant community on the Fleak soil is mainly prairie sandreed, little bluestem, plains muhly, and needleandthread. If the range is excessively grazed, the proportion of prairie sandreed, little bluestem, and plains muhly decreases and the proportion of needleandthread, perennial short grasses, threadleaf sedge, yucca, and perennial forbs increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,200 pounds per acre of air-dry vegetation in years of above-normal precipitation and 700 pounds in years of below-normal precipitation.

The surface layer of these soils is susceptible to water erosion and soil blowing if it is disturbed or the range is overgrazed. Proper grazing use insures good plant vigor and adequate plant cover. Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. These soils are poorly suited to practices such as chiseling and scalping because they are susceptible to soil blowing and water erosion if they are disturbed.

Windbreaks.—The Yawdim and Fleak soils are very poorly suited to windbreaks. They are limited mainly by the very low available water capacity.

The Gerdrum soil is poorly suited to windbreaks. It is salt-affected, which limits the choice of trees and shrubs to Russian-olive and silver buffaloberry.

Homesite development.—The Gerdrum soil is poorly suited to homesite development. It is limited mainly by slow permeability, shrink-swell potential, and low soil strength. In the construction of basements or foundations for dwellings, the limitation of shrink-swell potential can be overcome by backfilling with suitable material that has low shrink-swell potential. If this soil is used for septic tank absorption fields, the limitation of slow permeability can be overcome by increasing the size of the absorption field or by excavating the trench to a suitable depth. The field or trench should be backfilled with gravel. Shrinking and swelling and low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations.

The Yawdim soil is poorly suited to homesite development. It is limited mainly by low soil strength, shrink-swell potential, shallow depth to semiconsolidated shale, and slow permeability. In the construction of basements or foundations for dwellings, the limitation of shrink-swell potential can be overcome by backfilling with suitable material that has low shrink-swell potential. This soil is poorly suited to septic tank absorption fields because of the slow permeability and shallow depth to semiconsolidated shale. Shrinking and swelling, low soil strength, and shallow depth to semiconsolidated shale can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations.

The Fleak soil is suited to homesite development. It has few limitations. Deep cuts needed to provide nearly level road surfaces can expose sedimentary beds that can easily be excavated.

This map unit is in capability subclass VIs, nonirrigated. The Gerdrum soil is in Clay Pan range site, 10- to 14-inch precipitation zone; the Yawdim soil is in Shallow Clay range site, 10- to 14-inch precipitation zone; and the Fleak soil is in Shallow range site, 10- to 14-inch precipitation zone.

72—Gerdrum-Yawdim-Fleak complex, 8 to 45 percent slopes. This map unit is on uplands in the western part of the county. Slopes are mainly less than 250 feet long. Elevation is 1,900 to 2,600 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

This unit is about 25 percent Gerdrum clay loam, 25 percent Yawdim silty clay, and 25 percent Fleak loamy sand. The strongly sloping Gerdrum soil is on fans. The moderately steep and steep Yawdim and Fleak soils are on the upper side slopes and tops of hills and ridges.

Included in this unit are small areas of Neldore, Vanda, and Absher soils. Also included are small areas of shale and sandstone outcroppings. Included areas make up about 25 percent of the total acreage. The areas of soils do not adversely affect the use and management of this unit as rangeland. The areas of shale and sandstone outcroppings limit the range production on the unit.

The Gerdrum soil is deep and well drained and is salt- and sodium-affected. It formed in alluvium. Typically, the surface layer, where mixed to a depth of 7 inches, is light brownish gray clay loam. The upper 4 inches of the subsoil is light brownish gray clay, and the lower 9 inches is light brownish gray clay loam. The substratum to a depth of 60 inches or more is mostly light brownish gray clay loam.

Permeability is slow, and available water capacity is moderate. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 20 inches. Runoff is moderate, and the hazard of water erosion is high. The hazard of soil blowing is moderate. This soil is strongly salt-affected and moderately sodium-affected at a depth of about 7 inches.

The Yawdim soil is shallow and well drained. It formed in material derived from semiconsolidated shale. Typically, the surface layer is grayish brown silty clay 6 inches thick. The underlying material to a depth of 15 inches is light olive gray silty clay. Below this to a depth of 60 inches or more is light olive gray, semiconsolidated

shale. Semiconsolidated shale is at a depth of 10 to 20 inches.

Permeability is slow, and available water capacity is very low. Effective rooting depth is limited by the semiconsolidated shale at a depth of 10 to 20 inches. Where this soil is under native vegetation, the average annual wetting depth is 10 to 20 inches. Runoff is rapid to very rapid, and the hazard of water erosion is high. The hazard of soil blowing is high. The soil is droughty.

The Fleak soil is shallow and somewhat excessively drained. It formed in material derived from weakly consolidated, sandy sedimentary beds. Typically, the surface layer, where mixed to a depth of 7 inches, is olive brown loamy sand. The underlying material to a depth of 16 inches is mostly olive loamy sand. Below this to a depth of 60 inches or more are mostly light olive brown, weakly consolidated, sandy sedimentary beds. Sedimentary beds are at a depth of 10 to 20 inches.

Permeability is rapid, and available water capacity is very low. Effective rooting depth is limited by the sedimentary beds at a depth of 10 to 20 inches. Where this soil is under native vegetation, the average annual wetting depth is 10 to 20 inches. Runoff is medium, and the hazard of water erosion is high. The hazard of soil blowing is high. The soil is droughty.

These soils are used as rangeland.

Cropland.—These soils are poorly suited to cultivated crops because the Yawdim and Fleak soils are steep, shallow, and droughty and because the Gerdrum soil is salt- and sodium-affected.

Rangeland.—The potential native plant community on the Gerdrum soil is mainly western wheatgrass, thickspike wheatgrass, green needlegrass, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, blue grama, Sandberg bluegrass, perennial forbs, and fringed sagewort increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,200 pounds per acre of air-dry vegetation in years of above-normal precipitation and 500 pounds in years of below-normal precipitation.

The potential native plant community on the Yawdim soil is mainly western wheatgrass, green needlegrass, thickspike wheatgrass, and Nuttall saltbush. If the range is excessively grazed, the proportion of these plants decreases and the proportion of Sandberg bluegrass, blue grama, big sagebrush, perennial forbs, and rabbitbrush increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,100 pounds per acre of air-dry vegetation in years of above-normal precipitation and 700 pounds in years of below-normal precipitation.

The potential native plant community on the Fleak soil is mainly prairie sandreed, little bluestem, plains muhly, and needleandthread. If the range is excessively grazed, the proportion of prairie sandreed, little bluestem, and plains muhly decreases and the proportion of needleandthread, upland sedges, perennial short grasses, yucca, perennial forbs, and fringed sagewort increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,200 pounds per acre of air-dry vegetation in years of above-normal precipitation and 700 pounds in years of below-normal precipitation.

Steepness of slope limits access by livestock and promotes overgrazing of the less sloping areas of these soils. Use of mechanical treatment practices is not practical.

Windbreaks.—The Yawdim and Fleak soils are not suited to windbreaks. They are limited mainly by their very low available water capacity and steepness of slope.

The Gerdrum soil is poorly suited to windbreaks. It is salt-affected, which limits the choice of trees and shrubs to Russian-olive and silver buffaloberry.

Homesite development.—The Gerdrum soil is poorly suited to homesite development. It is limited mainly by slow permeability, low soil strength, and shrink-swell potential. In the construction of basements or foundations for dwellings, the limitation of shrink-swell potential can be overcome by backfilling with suitable material that has low shrink-swell potential. If this soil is used for septic tank absorption fields, the limitation of slow permeability can be overcome by increasing the size of the absorption field or by excavating the trench to a suitable depth. The field or trench should be backfilled with gravel. Shrinking and swelling and low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations.

The Yawdim and Fleak soils are poorly suited to homesite development because of the steepness of slope.

This map unit is in capability subclass VIIe, nonirrigated. The Gerdrum soil is in Clay Pan range site, 10- to 14-inch precipitation zone; the Yawdim soil is in Shallow Clay range site, 10- to 14-inch precipitation zone; and the Fleak soil is in Shallow range site, 10- to 14-inch precipitation zone.

73—Glendive sandy loam. This deep, well drained soil is on low terraces and flood plains of Prairie Elk Creek. The soil is in the north-central part of the county. It formed in alluvium. Slope is 0 to 2 percent. Slopes are mainly less than 1,000 feet long. Elevation is 1,900 to 2,600 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Hanly and Havre soils and Typic Fluvaquents. Also included are small areas of soils on short, steep slopes along terrace edges. The Hanly soils are occasionally flooded and are droughty. The Typic Fluvaquents are along streams and are frequently flooded. The areas of soils on short, steep slopes can be farmed around. The Havre soils do not adversely affect the use and management of this unit as rangeland and for nonirrigated and irrigated farming.

Typically, this Glendive soil has a surface layer of grayish brown sandy loam 6 inches thick. The underlying material to a depth of 60 inches or more is grayish brown and white sandy loam.

Permeability is moderately rapid, and available water capacity is moderate. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 30 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high. This soil is subject to rare periods of flooding during prolonged, high intensity storms. Channeling and deposition are common along streambanks.

This soil is used as rangeland and for nonirrigated and irrigated farming. The main nonirrigated and irrigated crops are wheat, oats, and barley. Irrigated alfalfa hay is also grown.

Cropland.—This soil is suited to nonirrigated and irrigated crops. It is limited mainly by moderate available water capacity and the hazards of soil blowing and flooding. The hazard of soil blowing is a serious management concern. The abrasive effect of the moving sand grains can damage seedlings. Timely tillage is critical because adequate moisture is needed in the surface layer to form clods that reduce soil blowing while the fields are nearly barren. Minimum tillage, tall grass barriers, stripcropping, and stubble mulch tillage conserve moisture and reduce soil blowing. Planting may need to be delayed because of flooding.

In summer, irrigation is required for maximum production of most crops. Furrow, border, corrugation, and sprinkler irrigation systems are suited to this soil. Because the soil is droughty, light and frequent applications of irrigation water are needed. Leveling is needed in some areas for the efficient application and removal of irrigation water.

Rangeland.—The potential native plant community is mainly prairie sandreed, little bluestem, big bluestem, and needleandthread. If the range is excessively grazed, the proportion of prairie sandreed, little bluestem, and big bluestem decreases and the proportion of needleandthread, perennial short grasses, thickspike wheatgrass, and silver sagebrush increases. If excessive grazing continues, plants such as red threeawn, Kentucky bluegrass, annuals, and weedlike forbs may invade. The potential native plant community produces about 2,000 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,200 pounds in years of below-normal precipitation.

Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Areas of deteriorated rangeland can be improved by mechanical treatment practices such as shallow chiseling and scalping. Forage yields on this soil generally can be increased by the use of water spreading.

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

Homesite development.—This soil is poorly suited to homesite development because of the hazard of rare flooding.

This map unit is in capability subclasses IIIe, nonirrigated, and IIs, irrigated. It is in Sandy range site, 10- to 14-inch precipitation zone.

74—Glendive loam. This deep, well drained soil is on low terraces and flood plains of the Missouri River and its tributaries. The soil is in the western part of the county. It formed in alluvium. Slope is 0 to 2 percent. Slopes are mainly less than 1,000 feet long. Elevation is 1,900 to 2,600 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Hanly and Havre soils and Typic Fluvaquents. Also included are small areas of soils on short, steep slopes along terrace edges. The Hanly soils are occasionally flooded and are droughty. The Typic Fluvaquents are along streams and are frequently flooded. The areas of soils on short, steep slopes can be farmed around. The Havre soils do not adversely affect the use and management of this unit as rangeland and for nonirrigated and irrigated farming.

Typically, this Glendive soil has a surface layer of grayish brown loam 6 inches thick. The underlying material to a depth of 60 inches or more is grayish brown fine sandy loam stratified with thin lenses of loamy fine sand.

Permeability is moderately rapid, and available water capacity is moderate. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 30 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate. This soil is calcareous throughout. It is subject to rare periods of flooding during prolonged, high intensity storms. Channeling and deposition are common along streambanks.

This soil is used as rangeland and for nonirrigated and irrigated farming. The main nonirrigated and irrigated crops are wheat, oats, and barley. Irrigated alfalfa hay is also grown. If this soil is irrigated, it is prime farmland.

Cropland.—This soil is well suited to nonirrigated and irrigated crops. It is limited mainly by moderate available water capacity, the hazard of soil blowing, and the possibility of flooding. Crops respond to nitrogen and phosphorus fertilizer. Because of droughtiness, successful crop production depends on receiving average or above-average rainfall during the early part of the growing season. Minimum tillage, tall grass barriers, stripcropping, and stubble mulch tillage conserve moisture and reduce soil blowing. Flooding may delay planting.

In summer, irrigation is required for maximum production of most crops. Furrow, border, corrugation, and sprinkler irrigation systems are suited to this soil. Because the soil is droughty, light and frequent applications of irrigation water are needed. Leveling is needed in some areas for the efficient application and removal of irrigation water.

Rangeland.—The potential native plant community is mainly western wheatgrass, green needlegrass, little bluestem, big bluestem, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, perennial short grasses, silver sagebrush, and perennial forbs increases. If excessive grazing continues, plants such as Kentucky bluegrass, thistles, and annuals may invade. The potential native plant community produces about 1,800 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,200 pounds in years of below-normal precipitation.

Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Areas of deteriorated rangeland can be improved by mechanical treatment practices such as shallow chiseling and scalping. Forage yields on this soil generally can be increased by the use of water spreading.

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

Homesite development.—This soil is poorly suited to homesite development because of the hazard of rare flooding.

This map unit is in capability subclasses IIIe, nonirrigated, and IIs, irrigated. It is in Silty range site, 10- to 14-inch precipitation zone.

75—Glendive loam, protected. This deep, well drained soil is on high terraces along the Missouri River. The soil is in the northern part of the county. It formed in alluvium. Slope is 0 to 2 percent. Slopes are mainly more than 1,000 feet long. Elevation is 1,900 to 2,100 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Harlem soils, Glendive silty clay loam, and Havre soils. These areas do not adversely affect the use and management of this unit as rangeland and for nonirrigated and irrigated farming.

Typically, this Glendive soil has a surface layer of grayish brown loam 6 inches thick. The underlying material to a depth of 60 inches or more is grayish brown fine sandy loam stratified with thin lenses of loamy fine sand.

Permeability is moderately rapid, and available water capacity is moderate. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 30 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate. This soil is calcareous throughout. It is protected from flooding by Fort Peck Dam.

This soil is used as rangeland and for nonirrigated and irrigated farming. The main nonirrigated and irrigated crops are wheat, oats, and barley. Irrigated alfalfa hay is also grown. If this soil is irrigated, it is prime farmland.

Cropland.—This soil is well suited to nonirrigated and irrigated crops. It is limited mainly by moderate available water capacity and the hazard of soil blowing. Crops respond to nitrogen and phosphorus fertilizer. Because of the droughtiness of the soil, successful crop production depends on receiving average or above-average rainfall during the early part of the growing season. Minimum tillage, tall grass barriers, stripcropping, and stubble mulch tillage conserve moisture and control soil blowing.

In summer, irrigation is required for maximum production of most crops. Furrow, border, corrugation, and sprinkler irrigation systems are suited to this soil. Because the soil is droughty, light and frequent applications of irrigation water are needed. Leveling is needed in some areas for the efficient application and removal of irrigation water.

Rangeland.—The potential native plant community is mainly western wheatgrass, green needlegrass, little bluestem, and big bluestem. If the range is excessively grazed, the proportion of these grasses decreases and the proportion of needleandthread, perennial short grasses, fringed sagewort, and silver sagebrush increases. If excessive grazing continues, plants such as Kentucky bluegrass, thistles, and annuals may invade. The potential native plant community produces about 1,600 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,000 pounds in years of below-normal precipitation.

Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Areas of deteriorated rangeland can be improved by mechanical treatment practices such as shallow chiseling and scalping. In places, control of silver sagebrush improves production of desirable forage plants.

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

Woodland.—This soil is suited to plains cottonwood. The site index for plains cottonwood is 65. The potential annual production (CMAI) per acre is about 30 cubic feet or 160 board feet (Scribner rule). Potential production is for an even-aged, fully stocked stand of trees.

The main limitation for timber management is the difficulty of reestablishing stands of plains cottonwood. The understory vegetation competes vigorously with tree seedlings for the limited amount of available water. Shelterwood and selection silvicultural harvesting systems improve regeneration. Immediate site preparation and planting after harvest also may help.

Where this soil is forested, the composition and yield of the plants in the forest understory are different from those of plants on rangeland. Yield is reduced as the overstory tree canopy increases. The potential native forest understory plants beneath a fully stocked stand of plains cottonwood are western wheatgrass, green needlegrass, rose, snowberry, common chokecherry, prairie junegrass, poison-ivy, American licorice, green ash, Saskatoon serviceberry, redosier dogwood, silver buffaloberry, and starry false-Solomons-seal.

Homesite development.—This soil is well suited to homesite development. It has few limitations. In places, excavation for roads can expose material that is highly susceptible to soil blowing.

This map unit is in capability subclasses IIIe, nonirrigated, and IIs, irrigated. It is in Silty range site, 10- to 14-inch precipitation zone.

76—Glendive silty clay loam. This deep, well drained soil is on low terraces and flood plains of the Missouri River and its tributaries. The soil is in the northwestern part of the county. It formed in alluvium. Slope is 0 to 2 percent. Slopes are mainly less than 1,000 feet long. Elevation is 1,900 to 2,600 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Havre and Harlem soils and Typic Fluvaquents. The Typic Fluvaquents are along streams and are frequently flooded. The Havre and Harlem soils do not adversely affect the use and management of this unit for nonirrigated and irrigated farming and as rangeland.

Typically, this Glendive soil has a surface layer of grayish brown silty clay loam 6 inches thick. The upper 15 inches of the underlying material is grayish brown loamy fine sand, and the lower part to a depth of 60 inches or more is grayish brown, stratified sandy loam and loam.

Permeability is moderately rapid, and available water capacity is moderate. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 30 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate. This soil is calcareous throughout. It is subject to rare periods of flooding during prolonged, high intensity storms. Channeling and deposition are common along streambanks.

This soil is used as rangeland and for nonirrigated and irrigated farming. The main nonirrigated and irrigated crops are wheat, oats, and barley. Irrigated alfalfa hay is also grown. If this soil is irrigated, it is prime farmland.

Cropland.—This soil is well suited to nonirrigated and irrigated crops. It is limited mainly by the texture of the surface layer, the hazard of soil blowing, and the possibility of flooding. The soil is difficult to till when dry, and it is subject to clodding and compaction if it is tilled when wet. The content of soil moisture is optimum for tillage for only a short period. Leaving crop residue on or near the surface conserves moisture, increases the water intake rate, and improves tilth. Flooding may delay planting.

Furrow, border corrugation, and sprinkler irrigation systems are suited to this soil. Because of the slow water intake rate of the soil, water should be applied at a slow rate over a long period to insure that the root zone is properly wetted. This should be considered when designing irrigation systems.

Rangeland.—The potential native plant community is mainly western wheatgrass, green needlegrass, thickspike wheatgrass, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of Sandberg bluegrass, blue grama, silver sagebrush, and perennial forbs increases. If excessive grazing continues, plants such as annuals, Kentucky bluegrass, and thistles may invade. The potential native plant community produces about 2,000 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,200 pounds in years of below-normal precipitation.

Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Areas of deteriorated rangeland can be improved by mechanical treatment practices such as shallow chiseling, contour furrowing, or scalping. Control of silver sagebrush reduces its competition with desirable forage plants.

Forage yields generally can be increased by the use of water spreading.

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

Homesite development.—This soil is poorly suited to homesite development because of the hazard of rare flooding.

This map unit is in capability subclasses IIIe, nonirrigated, and IIs, irrigated. It is in Clayey range site, 10- to 14-inch precipitation zone.

77—Glendive silty clay loam, protected. This deep, well drained soil is on high terraces of the Missouri River. The soil is in the northwestern part of the county. It formed in alluvium. Slope is 0 to 2 percent. Slopes are mainly more than 1,000 feet long. Elevation is 1,900 to 2,100 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Havre, Harlem, and Glendive soils. These areas do not adversely affect the use and management of this unit as rangeland and for nonirrigated and irrigated farming.

Typically, this Glendive soil has a surface layer of grayish brown silty clay loam 6 inches thick. The upper 15 inches of the underlying material is grayish brown loamy fine sand, and the lower part to a depth of 60 inches or more is grayish brown, stratified sandy loam and loam.

Permeability is moderately rapid, and available water capacity is moderate. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 30 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate. This soil is calcareous throughout. It is protected from flooding by Fort Peck Dam.

This soil is used as rangeland and for nonirrigated and irrigated farming. The main nonirrigated and irrigated crops are wheat, oats, and barley. Irrigated alfalfa hay is also grown. If this soil is irrigated, it is prime farmland.

Cropland.—This soil is well suited to nonirrigated and irrigated crops. It is limited mainly by the silty clay loam surface layer and the hazard of soil blowing. The soil is difficult to till when dry, and it is subject to clodding and compaction if it is tilled when wet. The content of soil moisture is optimum for tillage for only a short period. Leaving crop residue on or near the surface conserves moisture, increases the water intake rate, and improves tilth.

This soil is suited to irrigated crops. Furrow, border, corrugation, and sprinkler irrigation systems are suited to this soil. Because of the slow water intake rate of the soil, water should be applied at a slow rate over a long period to insure that the root zone is properly wetted. This should be considered when designing irrigation systems.

Rangeland.—The potential native plant community is mainly western wheatgrass, green needlegrass, thickspike wheatgrass, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of blue grama, silver sagebrush, and fringed sagewort increases. If excessive grazing continues, plants such as Kentucky bluegrass, thistles, and annuals may invade. The potential native plant community produces about 1,800 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,000 pounds in years of below-normal precipitation.

Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Areas of deteriorated rangeland can be improved by mechanical treatment practices such as shallow chiseling and scalping. Control of silver sagebrush reduces its competition with desirable forage plants.

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

Woodland.—This soil is suited to plains cottonwood. The site index for plains cottonwood is 65. The potential annual production (CMAI) per acre is about 30 cubic feet or 160 board feet (Scribner rule). Potential production is for an even-aged, fully stocked stand of trees.

The main limitations for timber management are the difficulty of reestablishing stands of plains cottonwood and the susceptibility of the soil to compaction. The understory vegetation competes vigorously with tree seedlings for the limited amount of available water. Shelterwood and selection silvicultural harvesting systems improve regeneration. Immediate site preparation and planting after harvest also may help.

The soil has low strength when wet, which results in poor trafficability and the possibility of soil compaction when heavy equipment is used to yard logs. Operating equipment only when the soil is dry or frozen can overcome this limitation.

Where this soil is forested, the composition and yield of the plants in the forest understory are different from those of plants on areas of rangeland. Yield is reduced as the overstory tree canopy increases. The potential native forest understory plants beneath a fully stocked stand of plains cottonwood are western wheatgrass, green needlegrass, rose, snowberry, common

chokecherry, prairie junegrass, poison-ivy, American licorice, green ash, Saskatoon serviceberry, redosier dogwood, silver buffaloberry, and starry false-Solomons-seal.

Homesite development.—This soil is well suited to homesite development. It has few limitations. In places, excavation for roads can expose material that is highly susceptible to soil blowing.

This map unit is in capability subclasses IIIe, nonirrigated, and IIs, irrigated. It is in Clayey range site, 10- to 14-inch precipitation zone.

78—Glendive-Hanly complex, protected. This map unit is on high terraces of the Missouri River. The unit is in the northwestern part of the county. Slope is 0 to 2 percent. Slopes are mainly less than 250 feet long. Elevation is 1,900 to 2,100 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

This unit is about 45 percent Glendive sandy loam and 35 percent Hanly loamy fine sand. The unit has a hummocky topography. The Hanly soil is in higher areas, and the Glendive soil is in swales.

Included in this unit are small areas of Harlem and Havre soils. Included areas make up about 20 percent of the total acreage. These areas do not adversely affect the use and management of this unit as rangeland and for irrigated farming.

The Glendive soil is deep and well drained. It formed in alluvium. Typically, the surface layer is grayish brown sandy loam 6 inches thick. The underlying material to a depth of 60 inches or more is stratified, grayish brown and white sandy loam.

Permeability is moderately rapid, and available water capacity is moderate. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 30 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high. This soil is protected from flooding by Fort Peck Dam.

The Hanly soil is deep and somewhat excessively drained. It formed in sandy alluvium. Typically, the surface layer is grayish brown loamy fine sand 4 inches thick. The underlying material to a depth of 60 inches or more is light brownish gray loamy fine sand.

Permeability is rapid, and available water capacity is low. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 36 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high. This soil is droughty. It is protected from flooding by Fort Peck Dam.

These soils are used as rangeland and for irrigated farming. The main irrigated crops are wheat, oats, barley, and alfalfa hay. The soils are poorly suited to nonirrigated crops because of the high hazard of soil blowing and droughtiness.

Cropland.—These soils are suited to irrigated crops. In summer, irrigation is required for maximum production of most crops. Furrow, border, corrugation, and sprinkler irrigation systems are suited to the soils. Leveling is needed in some areas for the efficient application and removal of irrigation water. Because the soils are droughty, light and frequent applications of irrigation water are needed. Keeping a cover crop of grasses or legumes on these soils during the nonirrigation season reduces soil blowing.

Rangeland.—The potential native plant community on the Glendive soil is mainly prairie sandreed, little bluestem, big bluestem, and needleandthread. If the range is excessively grazed, the proportion of prairie sandreed, little bluestem, and big bluestem decreases and the proportion of needleandthread, blue grama, silver sagebrush, and perennial forbs increases. If excessive grazing continues, plants such as Kentucky bluegrass, thistles, and annuals may invade. The potential native plant community produces about 1,800 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,000 pounds in years of below-normal precipitation.

The potential native plant community on the Hanly soil is mainly sand bluestem, prairie sandreed, Indian ricegrass, little bluestem, and sun sedge. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, sand dropseed, blue grama, and perennial forbs increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 2,000 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,200 pounds in years of below-normal precipitation.

Seeding of native plants is an acceptable practice. These soils are not suited to practices such as shallow chiseling and scalping because they are extremely droughty and are more susceptible to soil blowing and water erosion if they are disturbed. Reestablishing plant cover is difficult.

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

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

Woodland.—The Glendive soil is suited to plains cottonwood. The site index for plains cottonwood is 65. The potential annual production (CMAI) per acre is about 30 cubic feet or 160 board feet (Scribner rule). Potential production is for an even-aged, fully stocked stand of trees.

The Hanly soil is suited to plains cottonwood. The site index for plains cottonwood is 60. The potential annual production (CMAI) per acre is about 25 cubic feet or 160 board feet (Scribner rule). Potential production is for an even-aged, fully stocked stand of trees.

The main limitation for timber management on these soils is the difficulty of reestablishing plains cottonwood. The understory vegetation competes vigorously with tree seedlings for the limited amount of available water.

Where these soils are forested, the composition and yield of the plants in the forest understory are different from those of plants on rangeland. Yield is reduced as the overstory tree canopy increases. The potential native forest understory plants beneath a fully stocked stand of plains cottonwood are prairie sandreed, Canada wildrye, slender wheatgrass, common chokecherry, snowberry, Woods rose, field horsetail, green ash, Rocky Mountain juniper, poison-ivy, American licorice, and western meadowrue.

Homesite development.—These soils are well suited to homesite development. They have few limitations. In places, excavation for roads can expose material that is highly susceptible to soil blowing. Effluent from septic tank absorption fields can seep into ground water and thus create a hazard to health.

This map unit is in capability subclasses VIe, nonirrigated, and IVe, irrigated. The Glendive soil is in Sandy range site, 10- to 14-inch precipitation zone, and the Hanly soil is in Sands range site, 10- to 14-inch precipitation zone.

79—Hanly loamy fine sand. This deep, somewhat excessively drained soil is on low terraces and flood plains of the Missouri River and its tributaries. The soil is in the northwestern part of the county. It formed in sandy alluvium. Slope is 0 to 2 percent. Slopes are mainly less than 250 feet long. Elevation is 1,900 to 2,600 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Glendive and Havre soils and Typic Fluvaquents. These areas do not adversely affect the use and management of this unit as rangeland.

Typically, this Hanly soil has a surface layer of grayish brown loamy fine sand 4 inches thick. The underlying material to a depth of 60 inches or more is light brownish gray loamy fine sand.

Permeability is rapid, and available water capacity is low. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 36 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high. This soil is droughty. It is subject to occasional periods of flooding during prolonged, high intensity storms and when ice jams the creeks during the spring runoff period. Channeling and deposition are common along streambanks.

This soil is used as rangeland.

Cropland.—This soil is poorly suited to cultivated crops because of occasional flooding, droughtiness, and the hazard of soil blowing.

Rangeland.—The potential native plant community is mainly sand bluestem, prairie sandreed, Indian ricegrass, little bluestem, and sun sedge. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, sand dropseed, blue grama, and perennial forbs increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 2,000 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,200 pounds in years of below-normal precipitation.

Seeding of native plants is an acceptable practice. This soil is not suited to practices such as shallow chiseling and scalping because it is extremely droughty and is more susceptible to soil blowing and water erosion if it is disturbed. Reestablishing plant cover is difficult.

Windbreaks.—This soil is poorly suited to windbreaks because of the low available water capacity and the hazard of soil blowing. The low available water capacity limits the growth of both trees and shrubs. Suitable trees for planting are Russian-olive, Siberian elm, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, western sandcherry, and skunkbush sumac.

Woodland.—This soil is suited to plains cottonwood. The site index for plains cottonwood is 65. The potential annual production (CMAI) per acre is about 30 cubic feet or 160 board feet (Scribner rule). Potential production is for an even-aged, fully stocked stand of trees.

The main limitations for timber management are the difficulty of reestablishing stands of plains cottonwood and the hazard of flooding. The understory vegetation competes vigorously with tree seedlings for the limited amount of available water. Water erosion is a hazard on this soil if it is disturbed.

Where this soil is forested, the composition and yield of the plants in the forest understory are different from those of plants on rangeland. Yield is reduced as the overstory tree canopy increases. The potential native forest understory plants beneath a fully stocked stand of plains cottonwood are prairie sandreed, Canada wildrye, slender wheatgrass, common chokecherry, snowberry, Woods rose, field horsetail, Rocky Mountain juniper, poison-ivy, and American licorice.

Homesite development.—This soil is poorly suited to homesite development because of the hazard of occasional flooding.

This map unit is in capability subclass VIw, nonirrigated. It is in Sands range site, 10- to 14-inch precipitation zone.

80—Harlem silty clay. This deep, well drained soil is on low terraces and flood plains of the Missouri River and its tributaries. The soil is in the western part of the county. It formed in alluvium. Slope is 0 to 2 percent. Slopes are mainly less than 1,000 feet long. Elevation is 1,900 to 2,600 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Havre and Dimmick soils. The Dimmick soils are in oxbows and depressional areas. They are not suited to cultivation because of wetness. The Havre soils do not adversely affect the use and management of this unit as rangeland and for nonirrigated and irrigated farming.

Typically, this Harlem soil has a surface layer of grayish brown silty clay 5 inches thick. The upper 18 inches of the underlying material is light brownish gray silty clay, and the lower part to a depth of 60 inches or more is grayish brown silty clay stratified with thin lenses of silt loam.

Permeability is slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 24 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate. This soil is subject to rare periods of flooding during prolonged, high intensity storms. Channeling and deposition are common along streambanks.

This soil is used as rangeland and for nonirrigated and irrigated farming. The main nonirrigated and irrigated crops are wheat, oats, and barley. Irrigated alfalfa hay is also grown. If this soil is irrigated, it is prime farmland.

Cropland.—This soil is well suited to nonirrigated and irrigated crops. It is limited mainly by the silty clay texture of the surface layer, the hazard of soil blowing, and the possibility of flooding. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, and stubble mulch tillage reduce soil blowing. This soil is difficult to till when dry, and it is subject to clodding and compaction if it is tilled when wet. The content of soil moisture is optimum for tillage for only a short period. Flooding may delay planting.

In summer, irrigation is required for maximum production of most crops. Sprinkler irrigation is the most suitable method of applying water. Use of this method permits the even, controlled application of water, reduces runoff, and minimizes the risk of erosion. Water should be applied at a slow rate over a long period to insure that the root zone is properly wetted.

Rangeland.—The potential native plant community is mainly western wheatgrass, green needlegrass, thickspike wheatgrass, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of Sandberg bluegrass, blue grama, silver sagebrush, and perennial forbs increases. If excessive grazing continues, plants such as Kentucky bluegrass, thistles, and annuals may invade. The potential native plant community produces about 2,000 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,400 pounds in years of below-normal precipitation.

Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Areas of deteriorated rangeland can be improved by mechanical treatment practices such as shallow chiseling or scalping. Control of silver sagebrush reduces its competition with desirable forage plants.

Windbreaks.—This soil is well suited to windbreaks. Suitable trees for planting are Russian-olive, white willow, golden willow, Siberian elm, Siberian crabapple, black hawthorn, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and western sandcherry.

Homesite development.—This soil is poorly suited to homesite development because of the hazard of rare flooding.

This map unit is in capability subclass IIIs, nonirrigated and irrigated. It is in Clayey range site, 10- to 14-inch precipitation zone.

81—Harlem silty clay, protected. This deep, well drained soil is on high terraces of the Missouri River. The soil is in the northwestern part of the county. It formed in alluvium. Slope is 0 to 2 percent. Slopes are mainly more than 1,000 feet long. Elevation is 1,900 to 2,100 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Havre and Dimmick soils. The Dimmick soils are in oxbows and depressional areas. They are not suited to cultivated crops because of wetness. The Havre soils do not adversely affect the use and management of this unit as rangeland and for nonirrigated and irrigated farming.

Typically, this Harlem soil has a surface layer of grayish brown silty clay 5 inches thick. The upper 18 inches of the underlying material is light brownish gray silty clay, and the lower part to a depth of 60 inches or more is grayish brown silty clay stratified with thin lenses of silt loam.

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

this soil is under native vegetation, the average annual wetting depth is about 24 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate. This soil is protected from flooding by Fort Peck Dam.

This soil is used as rangeland and for nonirrigated and irrigated farming. The main nonirrigated and irrigated crops are wheat, oats, and barley. Irrigated alfalfa hay is also grown. If this soil is irrigated, it is prime farmland.

Cropland.—This soil is well suited to nonirrigated and irrigated crops. It is limited mainly by the silty clay texture of the surface layer and the hazard of soil blowing. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, and stubble mulch tillage reduce soil blowing. This soil is difficult to till when dry, and it is subject to clodding and compaction if it is tilled when wet. The content of soil moisture is optimum for tillage for only a short period.

In summer, irrigation is required for maximum production of most crops. Sprinkler irrigation is the most suitable method of applying water. Use of this method permits the even, controlled application of water, reduces runoff, and minimizes the risk of erosion. Water should be applied at a slow rate over a long period to insure that the root zone is properly wetted.

Rangeland.—The potential native plant community is mainly western wheatgrass, green needlegrass, thickspike wheatgrass, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of blue grama, silver sagebrush, and fringed sagewort increases. If excessive grazing continues, plants such as Kentucky bluegrass, thistles, and annuals may invade. The potential native plant community produces about 1,800 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,000 pounds in years of below-normal precipitation.

Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Areas of deteriorated rangeland can be improved by mechanical treatment practices such as shallow chiseling and scalping. In places, control of silver sagebrush improves the production of desirable forage plants.

Windbreaks.—This soil is well suited to windbreaks. Suitable trees for planting are Russian-olive, white willow, golden willow, Siberian elm, Siberian crabapple, black hawthorn, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and western sandcherry.

Woodland.—This soil is suited to plains cottonwood. The site index for plains cottonwood is 65. The potential annual production (CMAI) per acre is about 30 cubic feet or 160 board feet (Scribner rule). Potential production is for an even-aged, fully stocked stand of trees.

The main limitations for timber management are the difficulty of reestablishing stands of plains cottonwood and the susceptibility of the soil to compaction. The understory vegetation competes vigorously with tree seedlings for the limited amount of available water. Shelterwood and selection silvicultural harvesting systems improve regeneration. Immediate site preparation and planting after harvest also may help.

The soil has low strength when wet, which results in poor trafficability and the possibility of soil compaction when heavy equipment is used to yard logs. Operating equipment only when the soil is dry or frozen can overcome this limitation.

Where this soil is forested, the composition and yield of the plants in the forest understory are different from those of plants on rangeland. Yield is reduced as the overstory tree canopy increases. The potential native forest understory plants beneath a fully stocked stand of plains cottonwood are western wheatgrass, green needlegrass, rose, snowberry, common chokecherry, prairie junegrass, poison-ivy, American licorice, green ash, Saskatoon serviceberry, redosier dogwood, silver buffaloberry, and starry false-Solomons-seal.

Homesite development.—This soil is poorly suited to homesite development. It is limited mainly by slow permeability, shrink-swell potential, and low soil strength. In the construction of basements or foundations for dwellings, the limitation of shrink-swell potential can be overcome by backfilling with suitable material that has low shrink-swell potential. If this soil is used for septic tank absorption fields, the limitation of slow permeability can be overcome by increasing the size of the absorption field or by excavating the trench to a suitable depth. The field or trench should be backfilled with gravel. Shrinking and swelling and low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations.

This map unit is in capability subclass IIIs, nonirrigated and irrigated. It is in Clayey range site, 10- to 14-inch precipitation zone.

82—Havre silt loam. This deep, well drained soil is on low terraces and flood plains of creeks in the western part of the county. It formed in alluvium. Slope is 0 to 2 percent. Slopes are mainly less than 1,000 feet long. Elevation is 1,900 to 2,600 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Harlem, Lonna, and Glendive soils. Also included are small areas of soils on short, steep slopes along terrace edges; these areas can be farmed around. The Harlem, Lonna, and Glendive soils do not adversely affect the use and management of this unit as rangeland and for nonirrigated and irrigated farming.

Typically, this Havre soil has a surface layer of light brownish gray silt loam 5 inches thick. The underlying material to a depth of 60 inches or more is light brownish gray silt loam and thin strata of fine sandy loam.

Permeability is moderate, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 24 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate. This soil is calcareous throughout. It is subject to rare periods of flooding during prolonged, high intensity storms and during the spring runoff period.

This soil is used for nonirrigated and irrigated farming and as rangeland. The main nonirrigated and irrigated crops are wheat, oats, and barley. Irrigated alfalfa hay is also grown. If this soil is irrigated, it is prime farmland.

Cropland.—This soil is well suited to nonirrigated and irrigated crops. It is limited mainly by the hazard of soil blowing and the possibility of flooding. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, and stubble mulch tillage reduce soil blowing. The surface layer of the soil has low organic matter content. Crops respond well to the application of phosphorus and nitrogen. Using green manure crops, barnyard manure, and crop residue increases the organic matter content and fertility. Flooding may delay planting.

In summer, irrigation is required for maximum production of most crops. Furrow, border, corrugation, and sprinkler irrigation systems are suited to this soil. Leveling is needed in sloping areas for the efficient application and removal of irrigation water.

Rangeland.—The potential native plant community is mainly western wheatgrass, green needlegrass, little bluestem, big bluestem, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, perennial short grasses, silver sagebrush, and perennial forbs increases. If excessive grazing continues, plants such as annuals, Kentucky bluegrass, thistles, and other weedlike forbs may invade. The potential native plant community produces about 2,000 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,200 pounds in years of below-normal precipitation.

The surface layer is susceptible to water erosion and soil blowing if it is disturbed or the range is overgrazed. Proper grazing use insures good plant vigor and adequate plant cover. Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Areas of deteriorated rangeland can be improved by mechanical treatment practices such as shallow chiseling and scalping. Forage yields can be increased by the use of water spreading. If the plant cover is disturbed for seeding or by mechanical treatment, protection from flooding may be needed to control gullying and sheet erosion until the plant cover is sufficiently reestablished. To reduce competition with desirable forage plants, control of silver sagebrush is a suitable practice.

Windbreaks.—This soil is well suited to windbreaks. Suitable trees for planting are Russian-olive, white willow, golden willow, Siberian elm, Siberian crabapple, black hawthorn, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and western sandcherry.

Homesite development.—This soil is poorly suited to homesite development because of the hazard of rare flooding.

This map unit is in capability subclasses IIIe, nonirrigated, and IIe, irrigated. It is in Silty range site, 10- to 14-inch precipitation zone.

83—Havre silt loam, protected. This deep, well drained soil is on high terraces along the Missouri River. The soil is in the northwestern part of the county. It formed in alluvium. Slopes are mainly more than 1,000 feet long. Elevation is 1,900 to 2,100 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Harlem and Glendive soils and Havre silty clay loam. These areas do not adversely affect the use and management of this unit as rangeland and for cropland.

Typically, this Havre soil has a surface layer of light brownish gray silt loam 5 inches thick. The underlying material to a depth of 60 inches or more is light brownish gray silt loam and thin strata of fine sandy loam.

Permeability is moderate, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 24 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate. This soil is calcareous throughout. It is protected from flooding by Fort Peck Dam.

This soil is used for nonirrigated and irrigated farming and as rangeland. The main nonirrigated and irrigated crops are wheat, oats, and barley. Irrigated alfalfa hay is also grown. If this soil is irrigated, it is prime farmland.

Cropland.—This soil is well suited to nonirrigated and irrigated crops. It is limited mainly by the hazard of soil blowing. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, and stubble mulch tillage reduce soil blowing. The surface layer of this soil has low organic matter content. Crops respond well to the application of phosphorus and nitrogen. Using green manure crops, barnyard manure, and crop residue increases the organic matter content and fertility of the soil.

In summer, irrigation is required for maximum production of most crops. Furrow, border, corrugation, and sprinkler irrigation systems are suited to this soil. Leveling is needed in some areas for the efficient application and removal of irrigation water.

Rangeland.—The potential native plant community is mainly western wheatgrass, green needlegrass, little bluestem, big bluestem, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, perennial short grasses, silver sagebrush, and perennial forbs increases. If excessive grazing continues, plants such as annuals, weedlike forbs, and Kentucky bluegrass may invade. The potential native plant community produces about 1,800 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,200 pounds in years of below-normal precipitation.

Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Areas of deteriorated rangeland can be improved by mechanical treatment practices such as shallow chiseling and scalping.

Windbreaks.—This soil is well suited to windbreaks. Suitable trees for planting are Russian-olive, white willow, golden willow, Siberian elm, Siberian crabapple, black hawthorn, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and western sandcherry.

Homesite development.—This soil is suited to homesite development. It is limited mainly by moderate permeability and low soil strength. If the soil is used for septic tank absorption fields, the limitation of moderate permeability can be overcome by increasing the size of the absorption field or by excavating the trench to a suitable depth. The field or trench should be backfilled with gravel. Low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome this limitation. In places, excavation for roads can expose material that is highly susceptible to soil blowing.

This map unit is in capability subclasses IIIe, nonirrigated, and IIe, irrigated. It is in Silty range site, 10- to 14-inch precipitation zone.

84—Havre silty clay loam. This deep, well drained soil is on low terraces and flood plains of the Missouri River and its tributaries. The soil is in the northwestern part of the county. It formed in alluvium. Slope is 0 to 2 percent. Slopes are mainly 250 to 1,000 feet long. Elevation is 1,900 to 2,100 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Harlem silt loam, Glendive silt loam, and Havre silt loam. Also included are small areas of soils on short, steep slopes along terrace edges; these areas can be farmed around. The Harlem, Glendive, and Havre soils do not adversely affect the use and management of this unit as rangeland and for nonirrigated and irrigated farming.

Typically, this Havre soil has a surface layer of grayish brown silty clay loam 9 inches thick. The upper 16 inches of the underlying material is stratified grayish brown silty clay loam and fine sandy loam, and the lower part to a depth of 60 inches or more is stratified, light brownish gray fine sandy loam and silt loam.

Permeability is moderate, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 24 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate. This soil is calcareous throughout. It is subject to rare periods of flooding during prolonged, high intensity storms and during the spring runoff.

This soil is used for nonirrigated and irrigated farming and as rangeland. The main nonirrigated and irrigated crops are wheat, oats, and barley. Irrigated alfalfa hay is also grown. If this soil is irrigated, it is prime farmland.

Cropland.—This soil is well suited to nonirrigated and irrigated crops. It is limited mainly by the silty clay loam texture of the surface layer, the hazard of soil blowing, and the possibility of flooding. The soil is difficult to till when dry, and it is subject to clodding and compaction if it is tilled when wet. The content of soil moisture is optimum for tillage for only a short period. Leaving crop residue on or near the surface conserves moisture, increases the water intake rate, and improves tilth. Flooding may delay planting.

Furrow, border, corrugation, and sprinkler irrigation systems are suited to this soil. Because of the slow water intake rate of the soil, water should be applied at a slow rate over a long period to insure that the root zone is properly wetted. This should be considered when designing irrigation systems.

Rangeland.—The potential native plant community is mainly western wheatgrass, green needlegrass, thickspike wheatgrass, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of Sandberg bluegrass, blue grama, silver sagebrush, and perennial forbs increases. If excessive grazing continues, plants such as annuals, Kentucky bluegrass, thistles, and other weedlike forbs may invade. The potential native plant community produces about 2,000 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,400 pounds in years of below-normal precipitation.

The surface layer is susceptible to water erosion and soil blowing if it is disturbed or the range is overgrazed. Proper grazing use insures good plant vigor and adequate plant cover. Rangeland seeding of native plants or adapted grasses and legumes is a suitable

practice. Areas of deteriorated rangeland can be improved by mechanical treatment practices such as shallow chiseling and scalping. Forage yields can be increased by the use of water spreading. If the plant cover is disturbed for seeding or by mechanical treatment, protection from flooding may be needed to control gullying and sheet erosion until the plant cover is sufficiently reestablished. To reduce competition with desirable forage plants, control of silver sagebrush is a suitable practice.

Windbreaks.—This soil is well suited to windbreaks. Suitable trees for planting are Russian-olive, white willow, golden willow, Siberian elm, Siberian crabapple, black hawthorn, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and western sandcherry.

Woodland.—This soil is suited to plains cottonwood. The site index for plains cottonwood is 70. The potential annual production (CMAI) per acre is about 35 cubic feet or 180 board feet (Scribner rule). Potential production is for an even-aged, fully stocked stand of trees.

The main limitations for timber management are the difficulty of reestablishing stands of plains cottonwood, the hazard of flooding, and susceptibility of the soil to compaction. The understory vegetation competes vigorously with tree seedlings for the limited amount of available water. Shelterwood and selection silvicultural harvesting systems improve regeneration. Immediate site preparation and planting after harvest also may help.

The soil has low strength when wet, which results in poor trafficability and the possibility of soil compaction when heavy equipment is used to yard logs. Operating equipment only when the soil is dry or frozen can overcome this limitation.

Where this soil is forested, the composition and yield of the plants in the forest understory are different from those of plants on rangeland. Yield is reduced as the overstory tree canopy increases. The potential native forest understory plants beneath a fully stocked stand of plains cottonwood are western wheatgrass, green needlegrass, rose, snowberry, common chokecherry, prairie junegrass, poison-ivy, American licorice, green ash, Saskatoon serviceberry, redosier dogwood, silver buffaloberry, and starry false-Solomons-seal.

Homesite development.—This soil is poorly suited to homesite development because of the hazard of rare flooding.

This map unit is in capability subclasses IIIe, nonirrigated, and IIe, irrigated. It is in Clayey range site, 10- to 14-inch precipitation zone.

85—Havre silty clay loam, protected. This deep, well drained soil is on high terraces along the Missouri River. The soil is in the northwestern part of the county. It formed in alluvium. Slope is 0 to 2 percent. Slopes are mainly more than 1,000 feet long. Elevation is 1,900 to 2,100 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Harlem silt loam, Glendive silt loam, and Havre silt loam. Also included are small areas of soils on short, steep slopes along terrace edges; these areas can be farmed around. The Harlem, Glendive, and Havre soils do not adversely affect the use and management of this unit as rangeland and cropland.

Typically, this Havre soil has a surface layer of grayish brown silty clay loam 9 inches thick. The upper 16 inches of the underlying material is stratified, grayish brown silty clay loam and fine sandy loam, and the lower part to a depth of 60 inches or more is stratified, light brownish gray fine sandy loam to silt loam.

Permeability is moderate, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 24 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate. This soil is calcareous throughout. It is protected from flooding by Fort Peck Dam.

This soil is used for nonirrigated and irrigated farming and as rangeland. The main nonirrigated and irrigated crops are wheat, oats, and barley. Irrigated alfalfa hay is also grown. If this soil is irrigated, it is prime farmland.

Cropland.—This soil is well suited to nonirrigated and irrigated crops. It is limited mainly by the silty clay loam texture of the surface layer and the hazard of soil blowing. The soil is difficult to till when dry, and it is subject to clodding and compaction if it is tilled when wet. The content of soil moisture is optimum for tillage for only a short period. Leaving crop residue on or near the surface conserves moisture, increases the water intake rate, and improves tilth.

Furrow, border, corrugation, and sprinkler irrigation systems are suited to this soil. Because of the slow water intake rate of the soil, water should be applied at a slow rate over a long period to insure that the root zone is properly wetted. This should be considered when designing irrigation systems.

Rangeland.—The potential native plant community is mainly western wheatgrass, green needlegrass, thickspike wheatgrass, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of Sandberg bluegrass, blue grama, silver sagebrush, and perennial forbs increases. If excessive grazing continues, plants such as annuals, Kentucky bluegrass, thistles, and other weedlike forbs may invade. The potential native plant community produces about 2,000 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,200 pounds in years of below-normal precipitation.

The surface layer is susceptible to water erosion and soil blowing if it is disturbed or the range is overgrazed. Proper grazing use insures good plant vigor and adequate plant cover. Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Areas of deteriorated rangeland can be improved by mechanical treatment practices such as shallow chiseling and scalping. To reduce competition with desirable forage plants, control of silver sagebrush is a suitable practice.

Windbreaks.—This soil is well suited to windbreaks. Suitable trees for planting are Russian-olive, white willow, golden willow, Siberian elm, Siberian crabapple, black hawthorn, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and western sandcherry.

Woodland.—The soil is suited to plains cottonwood. The site index for plains cottonwood is 65. The potential annual production (CMAI) per acre is about 30 cubic feet or 160 board feet (Scribner rule). Potential production is for an even-aged, fully stocked stand of trees.

The main limitations for timber management are the difficulty of reestablishing stands of plains cottonwood and susceptibility of the soil to compaction. The understory vegetation competes vigorously with tree seedlings for the limited amount of available water. Shelterwood and selection silvicultural harvesting systems improve regeneration. Immediate site preparation and planting after harvest also may help.

The soil has low strength when wet, which results in poor trafficability and the possibility of soil compaction when heavy equipment is used to yard logs. Operating equipment only when the soil is dry or frozen can overcome this limitation.

Where this soil is forested, the composition and yield of the plants in the forest understory are different from those of plants on rangeland. Yield is reduced as the overstory tree canopy increases. The potential native forest understory plants beneath a fully stocked stand of plains cottonwood are western wheatgrass, green needlegrass, rose, snowberry, common chokecherry, prairie junegrass, poison-ivy, American licorice, green ash, Saskatoon serviceberry, redosier dogwood, silver buffaloberry, and starry false-Solomons-seal.

Homesite development.—This soil is poorly suited to homesite development. It is limited mainly by moderate permeability and low soil strength. If the soil is used for septic tank absorption fields, the limitation of moderate permeability can be overcome by increasing the size of the absorption field or by excavating the trench to a suitable depth. The field or trench should be backfilled with gravel. Low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome this limitation. In places, excavation for roads can expose material that is highly susceptible to soil blowing.

This map unit is in capability subclasses IIIe, nonirrigated, and IIe, irrigated. It is in Clayey range site, 10- to 14-inch precipitation zone.

86—Havrelon loam. This deep, well drained soil is on low terraces and flood plains of the Missouri and Redwater Rivers and their tributaries. The soil is in the eastern part of the county. It formed in alluvium. Slope is 0 to 2 percent. Slopes are mainly more than 1,000 feet long. Elevation is 1,900 to 2,600 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Trembles, Cherry, and Ridgelawn soils. Also included are small areas of soils on short, steep slopes along terrace edges; these areas can be farmed around. The Trembles, Cherry, and Ridgelawn soils do not adversely affect the use and management of this unit as rangeland and for nonirrigated and irrigated farming.

Typically, this Havrelon soil has a surface layer of pale brown loam 5 inches thick. The underlying material to a depth of 60 inches or more is pale brown very fine sandy loam.

Permeability is moderate, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 30 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate. This soil is calcareous throughout. It is subject to rare periods of flooding during prolonged, high intensity storms. Channeling and deposition are common along streambanks.

This soil is used as rangeland and for nonirrigated and irrigated farming. The main nonirrigated and irrigated crops are wheat, oats, and barley. Irrigated alfalfa hay is also grown. If this soil is irrigated, it is prime farmland.

Cropland.—This soil is well suited to nonirrigated and irrigated crops. It is limited mainly by the hazard of soil blowing and the possibility of flooding. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, and stubble mulch tillage reduce soil blowing. The surface layer of this soil has low organic content. Using green manure crops, barnyard manure, and crop residue increases organic matter content and fertility. Crops respond well to the application of phosphorus and nitrogen. Flooding may delay planting.

In summer, irrigation is required for maximum production of most crops. Furrow, border, corrugation, and sprinkler irrigation systems are suited to this soil. Leveling is needed in sloping areas for the efficient application and removal of irrigation water.

Rangeland.—The potential native plant community is mainly western wheatgrass, green needlegrass, little bluestem, and big bluestem. If the range is excessively

grazed, the proportion of these grasses decreases and the proportion of needleandthread, perennial short grasses, fringed sagewort, and silver sagebrush increases. If excessive grazing continues, plants such as Kentucky bluegrass, thistles, and annuals may invade. The potential native plant community produces about 2,000 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,200 pounds in years of below-normal precipitation.

Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Areas of deteriorated rangeland can be improved by mechanical treatment practices such as shallow chiseling and scalping. In places, control of silver sagebrush improves production of desirable forage plants.

Windbreaks.—This soil is well suited to windbreaks. Suitable trees for planting are Russian-olive, white willow, golden willow, Siberian elm, Siberian crabapple, black hawthorn, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and western sandcherry.

Woodland.—This soil is suited to plains cottonwood. The site index for plains cottonwood is 70. The potential annual production (CMAI) per acre is about 35 cubic feet or 180 board feet (Scribner rule). Potential production is for an even-aged, fully stocked stand of trees.

The main limitation for timber management is the difficulty of reestablishing stands of plains cottonwood. The understory vegetation competes vigorously with tree seedlings for the limited amount of available water. Shelterwood and selection silvicultural harvesting systems improve regeneration. Immediate site preparation and planting after harvest also may help.

Where this soil is forested, the composition and yield of the plants in the forest understory are different from those of plants on rangeland. Yield is reduced as the overstory tree canopy increases. The potential native forest understory plants beneath a fully stocked stand of plains cottonwood are western wheatgrass, green needlegrass, rose, snowberry, common chokecherry, prairie junegrass, poison-ivy, American licorice, green ash, Saskatoon serviceberry, redosier dogwood, silver buffaloberry, and starry false-Solomons-seal.

Homesite development.—This soil is poorly suited to homesite development because of the hazard of rare flooding.

This map unit is in capability subclasses IIIe, nonirrigated, and IIe, irrigated. It is in Silty range site, 10- to 14-inch precipitation zone.

87—Havrelon loam, protected. This deep, well drained soil is on high terraces of the Missouri River. The soil is in the northeastern part of the county. It formed in alluvium. Slope is 0 to 2 percent. Slopes are mainly more than 1,000 feet long. Elevation is 1,900 to 2,100 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Trembles soils. Also included are small areas of soils on short, steep slopes along terrace edges; these areas can be farmed around. The Trembles soils do not adversely affect the use and management of this unit as rangeland and for nonirrigated and irrigated farming.

Typically, this Havrelon soil has a surface layer of pale brown loam 5 inches thick. The underlying material to a depth of 60 inches or more is pale brown very fine sandy loam.

Permeability is moderate, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 30 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate. This soil is calcareous throughout. It is protected from flooding by Fort Peck Dam.

This soil is used as rangeland and for nonirrigated and irrigated farming. The main nonirrigated and irrigated crops are wheat, oats, and barley. Irrigated alfalfa hay is also grown. If this soil is irrigated, it is prime farmland.

Cropland.—This soil is well suited to nonirrigated and irrigated crops. It is limited mainly by the hazard of soil blowing. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, and stubble mulch tillage reduce soil blowing. The surface layer of this soil has low organic matter content. Using green manure crops, barnyard manure, and crop residue increases the organic matter content and fertility. Crops respond well to the application of phosphorus and nitrogen.

In summer, irrigation is required for maximum production of most crops. Furrow, border, corrugation, and sprinkler irrigation systems are suited to this soil. Water should be applied at a slow rate over a long period to insure that the root zone is properly wetted. Leveling is needed in some areas for the efficient application and removal of irrigation water.

Rangeland.—The potential native plant community is mainly western wheatgrass, green needlegrass, little bluestem, and big bluestem. If the range is excessively grazed, the proportion of these grasses decreases and the proportion of needleandthread, perennial short grasses, fringed sagewort, and silver sagebrush increases. If excessive grazing continues, plants such as Kentucky bluegrass, thistles, and annuals may invade. The potential native plant community produces about 1,800 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,200 pounds in years of below-normal precipitation.

Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Areas of deteriorated rangeland can be improved by mechanical treatment practices such as shallow chiseling and

scalping. In places, control of silver sagebrush improves production of desirable forage plants.

Windbreaks.—This soil is well suited to windbreaks. Suitable trees for planting are Russian-olive, white willow, golden willow, Siberian elm, Siberian crabapple, black hawthorn, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and western sandcherry.

Woodland.—This soil is suited to plains cottonwood. The site index for plains cottonwood is 65. The potential annual production (CMAI) per acre is about 30 cubic feet or 160 board feet (Scribner rule). Potential production is for an even-aged, fully stocked stand of trees.

The main limitations for timber management are the difficulty of reestablishing stands of plains cottonwood, the hazard of flooding, and susceptibility of the soil to compaction. The understory vegetation competes vigorously with tree seedlings for the limited amount of available water. Shelterwood and selection silvicultural harvesting systems improve regeneration. Immediate site preparation and planting after harvest also may help.

Where this soil is forested, the composition and yield of the plants in the forest understory are different from those of plants on rangeland. Yield is reduced as the overstory tree canopy increases. The potential native forest understory plants beneath a fully stocked stand of plains cottonwood are western wheatgrass, green needlegrass, rose, snowberry, common chokecherry, prairie junegrass, poison-ivy, American licorice, green ash, Saskatoon serviceberry, redosier dogwood, silver buffaloberry, and starry false-Solomons-seal.

Homesite development.—This soil is suited to homesite development. It is limited mainly by moderate permeability and low soil strength. If the soil is used for septic tank absorption fields, the limitation of moderate permeability can be overcome by increasing the size of the absorption field or by excavating the trench to a suitable depth. The field or trench should be backfilled with gravel. Low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome this limitation. In places, excavation for roads can expose material that is highly susceptible to soil blowing.

This map unit is in capability subclasses IIIe, nonirrigated, and IIe, irrigated. It is in Silty range site, 10- to 14-inch precipitation zone.

88—Havrelon loam, saline. This deep, well drained, strongly salt-affected soil is on low terraces of creeks. The soil is in the northeastern part of the county. It formed in alluvium. Slope is 0 to 2 percent. Slopes are mainly 250 to 1,000 feet long. Elevation is 1,900 to 2,600 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Macar loam, saline; Alona loam; and Havrelon loam. These areas do not adversely affect the use and management of this unit as rangeland.

Typically, this Havrelon soil has a surface layer of grayish brown loam 5 inches thick. The upper 10 inches of the underlying material is light brownish gray sandy loam, the next 31 inches is light brownish gray, stratified sandy loam and sandy clay, and the lower part to a depth of 60 inches or more is light brownish gray fine sandy loam.

Permeability is moderate, and available water capacity is moderate. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 30 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate. This soil is strongly salt-affected at a depth of about 2 inches. It is subject to occasional periods of flooding during prolonged, high intensity storms and during the spring runoff.

This soil is used as rangeland.

Cropland.—This soil is very poorly suited to cultivated crops because the high content of salts reduces plant germination and reduces the availability of water and plant nutrients. These factors limit crop yields.

Rangeland.—The potential native plant community is mainly alkali cordgrass, alkali sacaton, Nuttall alkaligrass, Nuttall saltbush, and tall sedges. If the range is excessively grazed, the proportion of these plants decreases and the proportion of western wheatgrass, inland saltgrass, and bottlebrush squirreltail increases. If excessive grazing continues, plants such as foxtail barley, annual saltbush, and other annuals and weedlike forbs may invade. The potential native plant community produces about 3,500 pounds per acre of air-dry vegetation in years of above-normal precipitation and 2,000 pounds in years of below-normal precipitation.

Grazing should be delayed until the soil is firm and the more desirable forage plants have achieved sufficient growth to withstand grazing pressure. With increased grazing use, this soil may become more salty and thus produce less forage. Only the more salt-tolerant plants will grow. This soil is not suited to rangeland seeding because of its high content of salts.

Windbreaks.—This soil is not suited to windbreaks. It is limited mainly by the high content of salts.

Homesite development.—This soil is poorly suited to homesite development because of the hazard of occasional flooding.

This map unit is in capability subclass VIw, nonirrigated. It is in Saline Lowland range site, 10- to 14-inch precipitation zone.

89—Havrelon silty clay loam. This deep, well drained soil is on low terraces and flood plains of the Missouri

and Redwater Rivers and their tributaries. The soil is in the eastern part of the county. It formed in alluvium. Slope is 0 to 2 percent. Slopes are mainly more than 1,000 feet long. Elevation is 1,900 to 2,600 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Trembles loam, Cherry loam, and Havrelon loam. These areas do not adversely affect the use and management of this unit as rangeland and for nonirrigated and irrigated farming.

Typically, this Havrelon soil has a surface layer of light brownish gray silty clay loam 6 inches thick. The upper 13 inches of the underlying material is light brownish gray, stratified loam and silt loam, and the lower part to a depth of 60 inches or more is light brownish gray, stratified loam and silty clay.

Permeability is moderate, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 30 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate. This soil is calcareous throughout. It is subject to rare periods of flooding during prolonged, high intensity storms and spring runoff.

This soil is used as rangeland and for nonirrigated and irrigated farming. The main nonirrigated and irrigated crops are wheat, oats, and barley. Irrigated alfalfa hay is also grown. If this soil is irrigated, it is prime farmland.

Cropland.—This soil is well suited to nonirrigated and irrigated crops. It is limited mainly by the silty clay loam texture of the surface layer, the hazard of soil blowing, and the possibility of flooding. Cultivating or subjecting the soil to vehicular traffic when it is wet results in compaction and subsequent root damage. The surface layer of this soil is low in content of organic matter. Using green manure crops, barnyard manure, and crop residue increases organic matter content and fertility. Crops respond well to the application of phosphorus and nitrogen. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, and stubble mulch tillage reduce soil blowing. Flooding may delay planting.

In summer, irrigation is required for maximum production of most crops. Furrow, border, corrugation, and sprinkler irrigation systems are suited to this soil. Water should be applied at a slow rate over a long period to insure that the root zone is properly wetted. Leveling is needed in some areas for the efficient application and removal of irrigation water.

Rangeland.—The potential native plant community is mainly western wheatgrass, green needlegrass, thickspike wheatgrass, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of blue grama, silver sagebrush, and fringed sagewort increases. If excessive grazing continues, plants such as Kentucky bluegrass, thistles, and annuals may invade. The potential native plant community produces about 1,800 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,000 pounds in years of below-normal precipitation.

Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Areas of deteriorated rangeland can be improved by mechanical treatment practices such as shallow chiseling and scalping. Control of silver sagebrush reduces its competition with desirable forage plants.

Windbreaks.—This soil is well suited to windbreaks. Suitable trees for planting are Russian-olive, white willow, golden willow, Siberian elm, Siberian crabapple, black hawthorn, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and western sandcherry.

Woodland.—This soil is suited to plains cottonwood. The site index for plains cottonwood is 70. The potential annual production (CMAI) per acre is about 35 cubic feet or 180 board feet (Scribner rule). Potential production is for an even-aged, fully stocked stand of trees.

The main limitations for timber management are the difficulty of reestablishing stands of plains cottonwood and susceptibility of the soil to compaction. The understory vegetation competes vigorously with tree seedlings for the limited amount of available water. Shelterwood and selection silvicultural harvesting systems improve regeneration. Immediate site preparation and planting after harvest also may help.

This soil has low strength when wet, which results in poor trafficability and the possibility of soil compaction when heavy equipment is used to yard logs. Operating equipment only when the soil is dry or frozen can overcome this limitation.

Where this soil is forested, the composition and yield of the plants in the forest understory are different from those of plants on rangeland. Yield is reduced as the overstory tree canopy increases. The potential native forest understory plants beneath a fully stocked stand of plains cottonwood are western wheatgrass, green needlegrass, rose, snowberry, common chokecherry, prairie junegrass, poison-ivy, American licorice, green ash, Saskatoon serviceberry, redosier dogwood, silver buffaloberry, and starry false-Solomons-seal.

Homesite development.—This soil is poorly suited to homesite development because of the hazard of rare flooding.

This map unit is in capability subclasses IIIe, nonirrigated, and IIe, irrigated. It is in Clayey range site, 10- to 14-inch precipitation zone.

90—Havrelon silty clay loam, protected. This deep, well drained soil is on high terraces of the Missouri River. The soil is in the northeastern part of the county. It formed in alluvium. Slope is 0 to 2 percent. Slopes are mainly more than 1,000 feet long. Elevation is 1,900 to

2,100 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Trembles loam, Cherry loam, and Havrelon loam. These areas do not adversely affect the use and management of this unit as rangeland and for nonirrigated and irrigated farming.

Typically, this Havrelon soil has a surface layer of light brownish gray silty clay loam 6 inches thick. The upper 13 inches of the underlying material is light brownish gray, stratified loam and silt loam, and the lower part to a depth of 60 inches or more is light brownish gray, stratified loam and silty clay.

Permeability is moderate, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 30 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate. This soil is calcareous throughout. It is protected from flooding by Fort Peck Dam.

This soil is used mainly for nonirrigated and irrigated farming. It is also used as rangeland. The main nonirrigated and irrigated crops are wheat, oats, and barley. Irrigated alfalfa hay is also grown. If this soil is irrigated, it is prime farmland.

Cropland.—This soil is well suited to nonirrigated and irrigated crops. It is limited mainly by the silty clay loam texture of the surface layer and the hazard of soil blowing. Cultivating or subjecting the soil to vehicular traffic when it is wet results in compaction and subsequent root damage. The surface layer of this soil has low organic matter content. Using green manure crops, barnyard manure, and crop residue increases the organic matter content and fertility. Crops respond well to the application of phosphorus and nitrogen. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, and stubble mulch tillage reduce soil blowing.

In summer, irrigation is required for maximum production of most crops. Furrow, border, corrugation, and sprinkler irrigation systems are suited to this soil. Water should be applied at a slow rate over a long period to insure that the root zone is properly wetted. Leveling is needed in sloping areas for the efficient application and removal of irrigation water.

Rangeland.—The potential native plant community is mainly western wheatgrass, green needlegrass, thickspike wheatgrass, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of blue grama, silver sagebrush, and fringed sagewort increases. If excessive grazing continues, plants such as Kentucky bluegrass, thistles, and annuals may invade. The potential native plant community produces about 1,800 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,000 pounds in years of below-normal precipitation.

Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Areas of deteriorated rangeland can be improved by mechanical treatment practices such as shallow chiseling and scalping. Control of silver sagebrush reduces its competition with desirable forage plants.

Windbreaks.—This soil is well suited to windbreaks. Suitable trees for planting are Russian-olive, white willow, golden willow, Siberian elm, Siberian crabapple, black hawthorn, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and western sandcherry.

Woodland.—This soil is suited to plains cottonwood. The site index for plains cottonwood is 65. The potential annual production (CMAI) per acre is about 30 cubic feet or 160 board feet (Scribner rule). Potential production is for an even-aged, fully stocked stand of trees.

The main limitations for timber management are the difficulty of reestablishing stands of plains cottonwood and susceptibility of the soil to compaction. The understory vegetation competes vigorously with tree seedlings for the limited amount of available water. Shelterwood and selection silvicultural harvesting systems improve regeneration. Immediate site preparation and planting after harvest also may help.

This soil has low strength when wet, which results in poor trafficability and the possibility of soil compaction when heavy equipment is used to yard logs. Operating equipment only when the soil is dry or frozen can overcome this limitation.

Where this soil is forested, the composition and yield of the plants in the forest understory are different from those of plants on rangeland. Yield is reduced as the overstory tree canopy increases. The potential native forest understory plants beneath a fully stocked stand of plains cottonwood are western wheatgrass, green needlegrass, rose, snowberry, common chokecherry, prairie junegrass, poison-ivy, American licorice, green ash, Saskatoon serviceberry, redosier dogwood, silver buffaloberry, and starry false-Solomons-seal.

Homesite development.—This soil is suited to homesite development. It is limited mainly by moderate permeability, low soil strength, and shrink-swell potential. In the construction of basements or foundations for dwellings, the limitation of shrink-swell potential can be overcome by backfilling with suitable material that has low shrink-swell potential. If the soil is used for septic tank absorption fields, the limitation of moderate permeability can be overcome by increasing the size of the absorption field or by excavating the trench to a suitable depth. The field or trench should be backfilled with gravel. Shrinking and swelling and low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill

material that is properly compacted can overcome these limitations.

This map unit is in capability subclasses IIIe, nonirrigated, and IIe, irrigated. It is in Clayey range site, 10- to 14-inch precipitation zone.

91—Hillon loam, 2 to 8 percent slopes. This deep, well drained soil is on the sides and tops of low hills in the northwestern part of the county. It formed in glacial till. Slopes are mainly less than 1,000 feet long. Elevation is 2,000 to 2,500 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Telstad, Yamac, Thoeny, and Sunburst soils. The salt- and sodium-affected Thoeny soils are on fans and in swales. The salts and sodium reduce the availability of moisture and plant nutrients and restrict the penetration of roots and moisture into the subsoil. These characteristics limit crop yields. The Telstad, Yamac, and Sunburst soils do not adversely affect the use and management of this unit as rangeland and for nonirrigated farming.

Typically, this Hillon soil has a surface layer of grayish brown loam 7 inches thick. The underlying material to a depth of 60 inches or more is mostly light gray loam.

Permeability is slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 24 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high. This soil is calcareous throughout.

This soil is used mainly as rangeland. It is also used for nonirrigated farming. The main nonirrigated crops are wheat, oats, and barley.

Cropland.—This soil is well suited to nonirrigated crops. It is limited mainly by the hazards of soil blowing and water erosion. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, stubble mulch tillage, and grassed waterways reduce soil blowing and water erosion. The surface layer of this soil is low in organic matter content. Using green manure crops, barnyard manure, and crop residue increases the organic matter content and fertility. Crops respond well to the application of phosphorus and nitrogen.

Rangeland.—The potential native plant community is mainly western wheatgrass, green needlegrass, little bluestem, bluebunch wheatgrass, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, perennial short grasses, threadleaf sedge, fringed sagewort, and perennial forbs increases. If excessive grazing continues, plants such as annuals, weedlike forbs, and clubmoss may invade. The potential native plant community produces about 1,800 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,200 pounds in years of below-normal precipitation.

The surface layer is susceptible to water erosion and soil blowing if it is disturbed or the range is overgrazed. Proper grazing use insures good plant vigor and adequate plant cover. Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Where clubmoss and blue grama are the dominant vegetation, practices such as scalping or shallow chiseling can be used to improve the rangeland. Such practices increase water infiltration, reduce plant competition, and allow the more desirable native plants to increase.

Windbreaks.—This soil is suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian elm, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, and skunkbush sumac.

Homesite development.—This soil is poorly suited to homesite development. It is limited mainly by slow permeability and low soil strength. If the soil is used for septic tank absorption fields, the limitation of slow permeability can be overcome by increasing the size of the absorption field or by excavating the trench to a suitable depth. The field or trench should be backfilled with gravel. Low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome this limitation.

This map unit is in capability subclass IIIe, nonirrigated. It is in Silty range site, 10- to 14-inch precipitation zone.

92—Hillon loam, 8 to 15 percent slopes. This deep, well drained soil is on the sides and tops of hills and ridges in the northwestern part of the county. It formed in glacial till. Slopes are mainly less than 1,000 feet long. Elevation is 2,000 to 2,500 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Telstad, Yamac, Sunburst, Thoeny, and Yawdim soils. The shallow, well drained Yawdim soils are on the tops of ridges and hills. They are droughty and are low in productivity. The salt- and sodium-affected Thoeny soils are on fans and in swales. The salts and sodium reduce the availability of moisture and plant nutrients and restrict penetration of roots and moisture into the subsoil. These characteristics limit crop yields. The Telstad, Yamac, and Sunburst soils do not adversely affect the use and management of this unit as rangeland and for nonirrigated farming.

Typically, this Hillon soil has a surface layer of grayish brown loam 7 inches thick. The underlying material to a depth of 60 inches or more is mostly light gray loam.

Permeability is slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual

wetting depth is about 21 inches. Runoff is medium, and the hazard of water erosion is high. The hazard of soil blowing is high. This soil is calcareous throughout.

This soil is used mainly as rangeland. It is also used for nonirrigated farming. The main nonirrigated crops are wheat, oats, and barley.

Cropland.—This soil is suited to nonirrigated crops. It is limited mainly by the hazards of soil blowing and water erosion. Minimum tillage, contour cultivation, stripcropping, tall grass barriers, grassed waterways, and return of crop residue to the soil reduce soil blowing and water erosion. Tall grass barriers also reduce evaporation and trap snow, which increases the amount of moisture in the soil. Return of crop residue also helps to maintain good soil tilth. Chiseling stubble fields in fall on the contour or across the slope reduces runoff and water erosion. The surface layer of this soil is low in organic matter content. Using green manure crops, barnyard manure, and crop residue increases the organic matter content and fertility. Crops respond well to the application of phosphorus and nitrogen.

Rangeland.—The potential native plant community is mainly western wheatgrass, green needlegrass, little bluestem, bluebunch wheatgrass, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, perennial short grasses, threadleaf sedge, fringed sagewort, and perennial forbs increases. If excessive grazing continues, plants such as annuals, weedlike forbs, and clubmoss may invade. The potential native plant community produces about 1,600 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,000 pounds in years of below-normal precipitation.

The surface layer is susceptible to water erosion and soil blowing if it is disturbed or the range is overgrazed. Proper grazing use insures good plant vigor and adequate plant cover. Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Where clubmoss and blue grama are the dominant vegetation, practices such as scalping or shallow chiseling can be used to improve the rangeland. Such practices increase water infiltration, reduce plant competition, and allow the more desirable native plants to increase. Conducting fieldwork on the contour or across the slope, where practical, reduces erosion and conserves moisture.

Windbreaks.—This soil is suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian elm, white willow, golden willow, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, skunkbush sumac, and silver buffaloberry.

Homesite development.—This soil is poorly suited to homesite development. It is limited mainly by slow permeability and low soil strength. If the soil is used for septic tank absorption fields, the limitation of slow permeability can be overcome by increasing the size of the absorption field or by excavating the trench to a suitable depth. The field or trench should be backfilled with gravel. Slope is a concern in installing septic tank absorption lines. Absorption lines should be installed on the contour. Low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome this limitation.

This map unit is in capability subclass IVe, nonirrigated. It is in Silty range site, 10- to 14-inch precipitation zone.

93—Hillon loam, 15 to 45 percent slopes. This deep, well drained soil is on the sides and tops of ridges and hills in the northwestern part of the county. It formed in glacial till. Slopes are mainly less than 250 feet long. Elevation is 2,000 to 2,500 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Yawdim, Thoeny, and Telstad soils and areas of sandstone and shale outcroppings. The areas of soil do not adversely affect the use and management of this unit as rangeland. The areas of sandstone and shale outcroppings limit the range production on the unit.

Typically, this Hillon soil has a surface layer of grayish brown loam 5 inches thick. The underlying material to a depth of 60 inches or more is mostly light gray loam.

Permeability is slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 18 inches. Runoff is medium, and the hazard of water erosion is high. The hazard of soil blowing is high. This soil is calcareous throughout.

This soil is used as rangeland. It is very poorly suited to cultivated crops because of steepness of slope.

Rangeland.—The potential native plant community is mainly little bluestem, bluebunch wheatgrass, sideoats grama, plains muhly, western wheatgrass, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, perennial short grasses, fringed sagewort, and creeping juniper increases. If excessive grazing continues, plants such as annuals, weedlike forbs, and clubmoss may invade. The potential native plant community produces about 1,400 pounds per acre of air-dry vegetation in years of above-normal precipitation and 850 pounds in years of below-normal precipitation.

Steepness of slope limits access by livestock and promotes overgrazing of the less sloping areas. The surface layer is susceptible to water erosion and soil blowing if it is disturbed or the range is overgrazed. Proper grazing use insures good plant vigor and adequate plant cover. This soil is very poorly suited to

rangeland seeding or mechanical treatment because of the steepness of slope.

Windbreaks.—This soil is not suited to windbreaks. It is limited mainly by the steepness of slope.

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

This map unit is in capability subclass VIe, nonirrigated. It is in Thin Silty range site, 10- to 14-inch precipitation zone.

94—Hillon-Badland complex, 15 to 45 percent slopes. This map unit is on uplands in the north-central part of the county. Slopes are mainly less than 250 feet long. Elevation is 2,000 to 2,500 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

This unit is about 35 percent Hillon loam and 35 percent Badland. The hilly to steep Hillon soil is on the sides and tops of hills and ridges. Badland consists of steep to very steep areas on coulees, ridges, and escarpments.

Included in this unit are small areas of Yawdim, Absher, Gerdrum, and Vanda soils. Also included are small areas of soils that have slopes of less than 15 percent. Included areas make up about 30 percent of the total acreage. These areas do not adversely affect the use and management of this unit as rangeland.

The Hillon soil is deep and well drained. It formed in glacial till. Typically, the surface layer is grayish brown loam 5 inches thick. The underlying material to a depth of 60 inches or more is mostly light gray loam.

Permeability is slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 18 inches. Runoff is medium to rapid, and the hazard of water erosion is high. The hazard of soil blowing is high. This soil is calcareous throughout.

Badland consists mainly of steep to very steep areas on barren and nearly barren escarpments, narrow ridges, and deeply entrenched coulees. These areas were formed by the active geologic erosion of weakly consolidated, sandy and silty sedimentary beds and semiconsolidated shale.

Runoff is rapid or very rapid, and the hazard of water erosion is very high. The hazard of soil blowing is high.

This unit is used as rangeland.

Cropland.—This unit is not suited to cultivated crops because of the steepness of slope and the areas of Badland.

Rangeland.—The potential native plant community on the Hillon soil is mainly little bluestem, bluebunch wheatgrass, sideoats grama, plains muhly, western wheatgrass, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, perennial short grasses, fringed sagewort, and creeping juniper increases. If excessive grazing continues, plants such as annuals, weedlike forbs, and clubmoss may invade. The potential native plant community produces about 1,400 pounds per acre of air-dry vegetation in years of above-normal precipitation and 850 pounds in years of below-normal precipitation.

Steepness of slope limits access by livestock and promotes overgrazing of the less sloping areas. Trails or walkways can be constructed in places to encourage livestock grazing in areas where access is limited. The surface layer is susceptible to water erosion and soil blowing if it is disturbed or the range is overgrazed. Proper grazing use insures good plant vigor and adequate plant cover. Use of mechanical treatment practices is not practical.

Windbreaks.—This unit is not suited to windbreaks because of the steepness of slope and the large areas of Badland.

Homesite development.—This unit is poorly suited to homesite development because of the steepness of slope.

This map unit is in capability subclass VIIe, nonirrigated. It is in Thin Silty range site, 10- to 14-inch precipitation zone.

95—Hillon-Yamac-Fleak complex, 15 to 45 percent slopes. This map unit is on uplands in the northwestern part of the county. Slopes are mainly less than 250 feet long. Elevation is 2,000 to 2,500 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

This unit is about 30 percent Hillon loam, 30 percent Yamac loam, and 25 percent Fleak loamy sand. The hilly to steep Hillon soil is on the upper sides and tops of hills and ridges, the hilly to steep Yamac soil is on fans and lower side slopes, and the steep Fleak soil is on the tops of hills and ridges.

Included in this unit are small areas of Kremlin, Absher, and Busby soils and areas of sandstone outcroppings. Included areas make up about 15 percent of the total acreage. These areas of soil do not adversely affect the use and management of this unit as rangeland. The areas of sandstone outcroppings limit the range production on the unit.

The Hillon soil is deep and well drained. It formed in glacial till. Typically, the surface layer is grayish brown loam 5 inches thick. The underlying material to a depth of 60 inches or more is mostly light gray loam.

Permeability is slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 18 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is high. This soil is calcareous throughout.

The Yamac soil is deep and well drained. It formed in alluvium. Typically, the surface layer is grayish brown loam 4 inches thick. The upper 7 inches of the subsoil is olive loam, and the lower 8 inches is grayish brown loam. The substratum to a depth of 60 inches or more is pale olive loam.

Permeability is moderate, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 21 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is high. This soil is calcareous throughout.

The Fleak soil is shallow and somewhat excessively drained. It formed in material derived from weakly consolidated, sandy sedimentary beds. Typically, the surface layer, where mixed to a depth of 7 inches, is olive brown loamy sand. The underlying material to a depth of 16 inches is mostly olive loamy sand. Below this to a depth of 60 inches or more are mostly light olive brown, weakly consolidated, sandy sedimentary beds. Sedimentary beds are at a depth of 10 to 20 inches.

Permeability is rapid, and available water capacity is very low. Effective rooting depth is limited by the sedimentary beds at a depth of 10 to 20 inches. Where this soil is under native vegetation, the average annual wetting depth is 10 to 20 inches. Runoff is medium, and the hazard of water erosion is high. The hazard of soil blowing is high. This soil is droughty.

These soils are used as rangeland.

Cropland.—These soils are not suited to cultivated crops because of the steepness of slope.

Rangeland.—The potential native plant community on the Hillon soil is mainly little bluestem, bluebunch wheatgrass, sideoats grama, plains muhly, western wheatgrass, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, perennial short grasses, fringed sagewort, and creeping juniper increases. If excessive grazing continues, plants such as annuals, weedlike forbs, and clubmoss may invade. The potential native plant community produces about 1,400 pounds per acre of air-dry vegetation in years of above-normal precipitation and 850 pounds in years of below-normal precipitation.

The potential native plant community on the Yamac soil is mainly little bluestem, bluebunch wheatgrass, sideoats grama, plains muhly, western wheatgrass, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, perennial short grasses, fringed sagewort, and perennial forbs increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,400 pounds per acre of air-dry vegetation in years of above-normal precipitation and 850 pounds in years of below-normal precipitation.

The potential native plant community on the Fleak soil is mainly prairie sandreed, little bluestem, plains muhly, and needleandthread. If the range is excessively grazed, the proportion of prairie sandreed, little bluestem, and plains muhly decreases and the proportion of needleandthread, perennial short grasses, threadleaf sedge, yucca, and perennial forbs increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,200 pounds per acre of air-dry vegetation in years of above-normal precipitation and 700 pounds in years of below-normal precipitation.

Steepness of slope limits access by livestock and promotes overgrazing of the less sloping areas of these soils. These soils are not suited to rangeland seeding and mechanical treatment because of the steepness of slope.

Windbreaks.—These soils are not suited to windbreaks because of the steepness of slope.

Homesite development.—These soils are poorly suited to homesite development because of the steepness of slope.

This map unit is in capability subclass VIIe, nonirrigated. The Hillon and Yamac soils are in Thin Silty range site, 10- to 14-inch precipitation zone, and the Fleak soil is in Shallow range site, 10- to 14-inch precipitation zone.

96—Hoffmanville silty clay, protected. This deep, well drained soil is on high terraces along the Missouri River in the northern part of the county. It formed in alluvium. Slope is 0 to 2 percent. Slopes are mainly more than 1,000 feet long. Elevation is 1,900 to 2,100 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Havrelon, Lohler, and Trembles soils. The Havrelon and Trembles soils are susceptible to soil blowing. The Lohler soils do not adversely affect the use and management of this unit for nonirrigated and irrigated farming and as rangeland.

Typically, this Hoffmanville soil has a surface layer of grayish brown silty clay 5 inches thick. The upper 23 inches of the underlying material is grayish brown silty clay, and the lower part to a depth of 60 inches or more is light brownish gray loamy fine sand.

Permeability is slow to a depth of 28 inches and rapid below this depth. Available water capacity is moderate. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 28 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate. This soil is calcareous throughout. It is protected from flooding by Fort Peck Dam.

This soil is used mainly for nonirrigated and irrigated farming. It is also used as rangeland. The main nonirrigated and irrigated crops are wheat, oats, and

barley. Irrigated alfalfa hay is also grown. If this soil is irrigated, it is prime farmland.

Cropland.—This soil is suited to nonirrigated and irrigated crops. It is limited mainly by slow permeability, the hazard of soil blowing, and the silty clay texture of the surface layer. The soil is difficult to till when dry, and it is subject to clodding and compaction if it is tilled when wet. The content of soil moisture is optimum for tillage for only a short period. Keeping tillage at a minimum not only maintains the tilth of the surface layer but also increases water infiltration and reduces the risk of erosion. Soil blowing can be reduced by planting crops in alternate strips and at right angles to the prevailing wind. The surface layer of this soil is low in organic matter content. Using green manure crops, barnyard manure, and crop residue increases the organic matter content and fertility of the soil. Crops respond well to the application of phosphorus and nitrogen.

In summer, irrigation is required for maximum production of most crops. Sprinkler irrigation is the most suitable method of applying water. Use of this method permits the even, controlled application of water, reduces runoff, and minimizes the risk of erosion. Yields of hay and pasture crops can be increased by the use of water spreading. Because of the slow permeability of the soil, the length of runs should be adjusted to permit adequate infiltration of water.

Rangeland.—The potential native plant community is mainly western wheatgrass, green needlegrass, thickspike wheatgrass, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of blue grama, silver sagebrush, and fringed sagewort increases. If excessive grazing continues, plants such as Kentucky bluegrass, thistles, and annuals may invade. The potential native plant community produces about 1,800 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,000 pounds in years of below-normal precipitation.

Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Areas of deteriorated rangeland can be improved by mechanical treatment practices such as shallow chiseling and scalping. To reduce competition with desirable forage plants, control of silver sagebrush is a suitable practice.

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

Woodland.—This soil is suited to plains cottonwood. The site index for plains cottonwood is 65. The potential annual production (CMAI) per acre is about 30 cubic feet or 160 board feet (Scribner rule). Potential production is for an even-aged, fully stocked stand of trees.

The main limitations for timber management are the difficulty of reestablishing stands of plains cottonwood and susceptibility of the soil to compaction. The understory vegetation competes vigorously with tree seedlings for the limited amount of available water. Shelterwood and selection silvicultural harvesting systems improve regeneration. Immediate site preparation and planting after harvest also may help.

The soil has low strength when wet, which results in poor trafficability and the possibility of soil compaction when heavy equipment is used to yard logs. Operating equipment only when the soil is dry or frozen can overcome this limitation.

Where this soil is forested, the composition and yield of the plants in the forest understory are different from those of plants on rangeland. Yield is reduced as the overstory tree canopy increases. The potential native forest understory plants beneath a fully stocked stand of plains cottonwood are western wheatgrass, green needlegrass, rose, snowberry, common chokecherry, prairie junegrass, poison-ivy, American licorice, green ash, Saskatoon serviceberry, and silver buffaloberry.

Homesite development.—This soil is poorly suited to homesite development. It is limited mainly by slow permeability, shrink-swell potential, and low soil strength. If buildings are constructed on this soil, properly designing foundations and footings and diverting runoff away from buildings help to prevent structural damage as a result of shrinking and swelling. If the soil is used for septic tank absorption fields, the limitation of slow permeability can be overcome by increasing the size of the absorption field or by excavating the trench to a suitable depth. The field or trench should be backfilled with gravel. Shrinking and swelling and low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. If the soil is used as a base for roads, it can be mixed with the underlying porous material to increase its strength and stability.

This map unit is in capability subclasses IIIe, nonirrigated, and IIe, irrigated. It is in Clayey range site, 10- to 14-inch precipitation zone.

97—Kremlin loam, 0 to 4 percent slopes. This deep, well drained soil is on fans and terraces in the western part of the county. It formed in alluvium. Slopes are mainly 250 feet to more than 1,000 feet long. Elevation is 1,900 to 2,600 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Cambeth, Evanston, and Chinook soils. The Chinook soils are on fans and in swales. They are highly susceptible to soil blowing if the ground cover is disturbed. The Cambeth and Evanston soils do not adversely affect the use and

management of this unit as rangeland and for nonirrigated farming.

Typically, this Kremlin soil has a surface layer mostly of dark grayish brown loam 6 inches thick. The subsoil is dark grayish brown and light-brownish gray loam 7 inches thick. The upper 5 inches of the substratum is pale brown loam, and the lower part to a depth of 60 inches or more is mostly light gray loam.

Permeability is moderate, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 24 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

This soil is used mainly as rangeland. It is also used for nonirrigated farming. The main nonirrigated crops are wheat, oats, and barley.

Cropland.—This soil is well suited to nonirrigated crops. It is limited mainly by the hazard of soil blowing. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, and stubble mulch tillage reduce soil blowing.

Rangeland.—The potential native plant community is mainly western wheatgrass, green needlegrass, little bluestem, bluebunch wheatgrass, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, perennial short grasses, threadleaf sedge, fringed sagewort, silver sagebrush, and perennial forbs increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,800 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,200 pounds in years of below-normal precipitation.

Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Areas of deteriorated rangeland can be improved by mechanical treatment practices such as shallow chiseling and scalping.

Windbreaks.—This soil is well suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian elm, white willow, golden willow, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, skunkbush sumac, and silver buffaloberry.

Homesite development.—This soil is suited to homesite development. It is limited mainly by moderate permeability and low soil strength. Low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome this limitation. If this soil is used for septic tank absorption fields, the limitation of moderate permeability can be overcome by increasing the size of the absorption field or by excavating the trench to a suitable depth. The field or trench should be backfilled with gravel.

This map unit is in capability subclass IIIe, nonirrigated. It is in Silty range site, 10- to 14-inch precipitation zone.

98—Kremlin loam, 4 to 8 percent slopes. This deep, well drained soil is on fans in the west-central part of the county. It formed in alluvium. Slopes are mainly 250 to 1,000 feet long. Elevation is 1,900 to 2,600 feet. The average annual precipitation is about 15 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Cambeth, Chinook, Yamac, and Evanston soils. The Chinook and Yamac soils are on fans and foot slopes. They are highly susceptible to soil blowing. The Cambeth and Evanston soils do not adversely affect the use and management of this unit as rangeland and for nonirrigated farming.

Typically, this Kremlin soil has a surface layer mostly of dark grayish brown loam 6 inches thick. The subsoil is mostly dark grayish brown loam 7 inches thick. The upper 5 inches of the substratum is pale brown loam, and the lower part to a depth of 60 inches or more is mostly light gray loam.

Permeability is moderate, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 24 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

This soil is used mainly as rangeland. It is also used for nonirrigated farming. The main nonirrigated crops are wheat, oats, and barley.

Cropland.—This soil is well suited to nonirrigated crops. It is limited mainly by the hazards of soil blowing and water erosion. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, stubble mulch tillage, and grassed waterways reduce soil blowing and water erosion.

Rangeland.—The potential native plant community is mainly western wheatgrass, green needlegrass, little bluestem, bluebunch wheatgrass, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, perennial short grasses, threadleaf sedge, and perennial forbs increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,800 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,200 pounds in years of below-normal precipitation.

The surface layer is susceptible to water erosion and soil blowing if it is disturbed or the range is overgrazed. Proper grazing use insures good plant vigor and adequate plant cover. Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Areas of deteriorated rangeland can be improved by mechanical treatment practices such as shallow chiseling and scalping. Conducting fieldwork on

the contour or across the slope, where practical, reduces erosion and conserves moisture.

Windbreaks.—This soil is well suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian elm, white willow, golden willow, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, skunkbush sumac, and silver buffaloberry.

Homesite development.—This soil is suited to homesite development. It is limited mainly by moderate permeability and low soil strength. Low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome this limitation. If this soil is used for septic tank absorption fields, the limitation of moderate permeability can be overcome by increasing the size of the absorption field or by excavating the trench to a suitable depth. The field or trench should be backfilled with gravel.

This map unit is in capability subclass IIIe, nonirrigated. It is in Silty range site, 10- to 14-inch preciptation zone.

99—Lehr loam, 2 to 8 percent slopes. This deep, somewhat excessively drained soil is on terraces and outwash plains in the southeastern part of the county. It formed in alluvium. Slopes are mainly more than 1,000 feet long. Elevation is 1,900 to 3,400 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Shambo, Wabek, Lisk, and Macar soils. Also included are small areas of soils that have slopes or less than 2 percent. The Lisk and Macar soils are on terraces and fans. They are highly susceptible to soil blowing. The gravelly Wabek soils are on terrace edges. They are droughty and low in productivity. The Shambo soils do not adversely affect the use and management of this unit as rangeland and for nonirrigated crops.

Typically, this Lehr soil has a surface layer of brown loam 4 inches thick. The subsoil is mostly pale brown loam 14 inches thick. The substratum to a depth of 60 inches or more is very pale brown very gravelly fine sand. Very gravelly fine sand is at a depth of 14 to 20 inches.

Permeabilty is moderately rapid to a depth of 18 inches and very rapid below this depth. Available water capacity is low. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 30 inches. Runoff is slow to medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

This soil is used as rangeland and for nonirrigated crops. The main nonirrigated crops are wheat, oats, and barley.

Cropland.—This soil is suited to nonirrigated crops. It is limited mainly by the hazards of water erosion and soil blowing and by droughtiness. Because of the droughtiness of the soil, successful crop production depends on receiving average or above-average rainfall during the early part of the growing season. Minimum tillage, tall grass barriers, stripcropping, and stubble mulch tillage conserve moisture and reduce the hazards of water erosion and soil blowing.

Rangeland.—The potential native plant community is mainly bluebunch wheatgrass, western wheatgrass, little bluestem, and needleandthread. If the range is excessively grazed, the proportion of bluebunch wheatgrass, western wheatgrass, and little bluestem decreases and the proportion of needleandthread, perennial short grasses, fringed sagewort, and perennial forbs increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,200 pounds per acre of air-dry vegetation in years of above-normal precipitation and 700 pounds in years of below-normal precipitation.

The surface layer is susceptible to water erosion and soil blowing if it is disturbed or the range is overgrazed. Proper grazing use insures good plant vigor and adequate plant cover. Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice.

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

Homesite development.—This soil is well suited to homesite development. It has few limitations. Effluent from septic tank absorption fields may contaminate ground water because the soil is underlain by very gravelly fine sand at a depth of 14 to 20 inches.

This map unit is in capability subclass IVe, nonirrigated. It is in Shallow to Gravel range site, 10- to 14-inch precipitation zone.

100—Lisk sandy loam, 2 to 8 percent slopes. This deep, somewhat excessively drained soil is on fans and foot slopes and in swales in the eastern part of the county. It formed in eolian and alluvial material. Slopes are mainly 250 to 1,000 feet long. Elevation is 1,900 to 3,400 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Tally, Macar, Dast, Bryant, and Cambert soils. The Dast and Cambert soils are on the sides and tops of low hills. They are underlain by weakly consolidated sedimentary beds at a depth of 20 to 40 inches, which limit rooting depth. The Tally, Macar, and Bryant soils do not adversely affect the

use and management of this unit as rangeland and for nonirrigated crops.

Typically, the Lisk soil has a surface layer of grayish brown sandy loam 5 inches thick. The subsoil is light brownish gray sandy loam 10 inches thick. The upper 26 inches of the substratum is pale olive sandy loam, and the lower part to a depth of 60 inches or more is light gray loamy sand.

Permeability is moderately rapid, and available water capacity is moderate. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 36 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high.

This soil is used as rangeland and for nonirrigated crops. The main nonirrigated crops are wheat, oats, and barley.

Cropland. This soil is well suited to nonirrigated crops. It is limited mainly by the hazard of soil blowing. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, and stubble mulch tillage reduce soil blowing. Tall grass barriers also trap snow, which increases the amount of moisture in the soil.

Rangeland.—The potential native plant community is mainly prairie sandreed, little bluestem, big bluestem, needleandthread, and winterfat. If the range is excessively grazed, the proportion of prairie sandreed, little bluestem, and winterfat decreases and the proportion of needleandthread, perennial short grasses, perennial forbs, and silver sagebrush increases. If excessive grazing continues, plants such as red threeawn, annuals, and weedlike forbs may invade. The potential native plant community produces about 1,800 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,200 pounds in years of below-normal precipitation.

Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Areas of deteriorated rangeland can be improved by mechanical treatment practices such as shallow chiseling and scalping.

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

Homesite development.—This soil is well suited to homesite development. It has few limitations. In places, excavation for roads can expose material that is highly susceptible to soil blowing.

This map unit is in capability subclass IIIe, nonirrigated. It is in Sandy range site, 10- to 14-inch precipitation zone.

101—Lisk sandy loam, 8 to 15 percent slopes. This deep, somewhat excessively drained soil is on side slopes and fans in the east-central and northeastern parts of the county. It formed in eolian and alluvial material. Elevation is 1,900 to 3,400 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Tally, Macar, Dast, and Cabba soils. The Dast and Cabba soils are on the upper side slopes and tops of hills and ridges. The Cabba soils are shallow, and the Dast soils are moderately deep to weakly consolidated sedimentary beds, which limit rooting depth. The Tally and Macar soils do not adversely affect the use and management of this unit as rangeland and for nonirrigated crops.

Typically, this Lisk soil has a surface layer of grayish brown sandy loam 5 inches thick. The subsoil is light brownish gray sandy loam 10 inches thick. The upper 26 inches of the substratum is pale olive sandy loam, and the lower part to a depth of 60 inches or more is light gray loamy sand.

Permeability is moderately rapid, and available water capacity is moderate. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 36 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high.

This soil is used as rangeland and for nonirrigated crops. The main nonirrigated crops are wheat, oats, and barley.

Cropland.—This soil is suited to nonirrigated crops. It is limited mainly by the hazards of soil blowing and water erosion. Conducting fieldwork on the contour or across the slope, where practical, reduces erosion and conserves moisture. Minimum tillage, contour cultivation, stripcropping, tall grass barriers, grassed waterways, and return of crop residue to the soil reduce soil blowing and water erosion. Tall grass barriers also reduce evaporation and trap snow, which increase the amount of moisture in the soil. Return of crop residue also helps to maintain good soil tilth. Chiseling stubble fields in fall on the contour or across the slope reduces runoff and water erosion.

Rangeland.—The potential native plant community is mainly prairie sandreed, little bluestem, big bluestem, needleandthread, and winterfat. If the range is excessively grazed, the proportion of prairie sandreed, little bluestem, big bluestem, and winterfat decreases and the proportion of needleandthread, perennial short grasses, perennial forbs, and silver sagebrush increases. If excessive grazing continues, plants such as red threeawn, annuals, and weedlike forms may invade. The potential native plant community produces about 1,800 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,200 pounds in years of below-normal precipitation.

The surface layer is susceptible to water erosion and soil blowing if it is disturbed or the range is overgrazed. Proper grazing use insures good plant vigor and adequate plant cover. Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Areas of deteriorated rangeland can be improved by mechanical treatment practices such as shallow chiseling and scalping. Conducting fieldwork on the contour or across the slope, where practical, reduces erosion and conserves moisture.

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

Homesite development.—This soil is suited to homesite development. Slope is the main limitation and is a concern in installing septic tank absorption fields. Absorption lines should be installed on the contour. In places, excavation for roads can expose material that is highly susceptible to soil blowing.

This map unit is in capability subclass IVe, nonirrigated. It is in Sandy range site, 10- to 14-inch precipitation zone.

102—Lohler silty clay loam, protected. This deep, moderately well drained soil is on high terraces along the Missouri River. The soil is in the northeastern part of the county. It formed in alluvium. Slope is 0 to 2 percent. Slopes are mainly more than 1,000 feet long. Elevation is 1,900 to 2,100 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Hoffmanville, Havrelon, and Trembles soils. These areas do not adversely affect the use and management of this unit as rangeland and for nonirrigated and irrigated farming.

Typically, this Lohler soil has a surface layer of dark grayish brown silty clay loam 6 inches thick. The upper 29 inches of the underlying material is grayish brown, stratified silty clay and silty clay loam, and the lower part to a depth of 60 inches or more is grayish brown silty clay loam.

Permeability is moderately slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 30 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate. This soil is calcareous throughout. It has a water table at a depth of 4 to 6 feet during the irrigation season. The soil is protected from flooding by Fort Peck Dam.

This soil is used mainly for nonirrigated or irrigated farming. It is also used as rangeland. The main nonirrigated and irrigated crops are wheat, oats, and barley. Irrigated alfalfa hay is also grown. If this soil is irrigated, it is prime farmland.

Cropland.—This soil is suited to nonirrigated and irrigated crops. It is limited mainly by the hazard of soil blowing. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, and stubble mulch tillage reduce soil blowing. Crops respond to nitrogen and phosphorus fertilizer.

In summer, irrigation is required for maximum production of most crops. Sprinkler irrigation is the most suitable method of applying water. Use of this method permits the even, controlled application of water, reduces runoff, and minimizes the risk of erosion.

Rangeland.—The potential native plant community is mainly western wheatgrass, green needlegrass, thickspike wheatgrass, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of blue grama, silver sagebrush, and fringed sagewort increases. If excessive grazing continues, plants such as Kentucky bluegrass, thistles, and annuals may invade. The potential native plant community produces about 1,800 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,000 pounds in years of below-normal precipitation.

Rangeland seeding of native plants or adapted grasses and legumes ia a suitable practice. Areas of deteriorated rangeland can be improved by mechanical treatment practices such as shallow chiseling and scalping. To reduce competition with desirable forage plants, control of silver sagebrush is a suitable practice.

Windbreaks.—This soil is well suited to windbreaks. Suitable trees for planting are Russian-olive, white willow, golden willow, Siberian elm, Siberian crabapple, black hawthorn, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and western sandcherry.

Woodland.—This soil is suited to plains cottonwood. The site index for plains cottonwood is 65. The potential annual production (CMAI) per acre is about 30 cubic feet or 160 board feet (Scribner rule). Potential production is for an even-aged, fully stocked stand of trees.

The main limitations for timber management are the difficulty of reestablishing stands of plains cottonwood and susceptibility of the soil to compaction. The understory vegetation competes vigorously with tree seedlings for the limited amount of available water. Shelterwood and selection silvicultural harvesting systems improve regeneration. Immediate site preparation and planting after harvest also may help.

The soil has low strength when wet, which results in poor trafficability and the possibility of soil compaction when heavy equipment is used to yard logs. Operating

equipment only when the soil is dry or frozen can overcome this limitation.

Where this soil is forested, the composition and yield of the plants in the forest understory are different from those of plants on rangeland. Yield is reduced as the overstory tree canopy increases. The potential native forest understory plants beneath a fully stocked stand of plains cottonwood are western wheatgrass, green needlegrass, rose, snowberry, common chokecherry, prairie junegrass, poison-ivy, American licorice, green ash, Saskatoon serviceberry, redosier dogwood, silver buffaloberry, and starry false-Solomons-seal.

Homesite development.—This soil is poorly suited to homesite development. It is limited mainly by moderately slow permeability, low soil strength, shrink-swell potential, and wetness. Wetness can be reduced by installing drain tile around footings. If buildings are constructed on this soil, properly designing foundations and footings and diverting runoff away from buildings help to prevent structural damage as a result of shrinking and swelling. The soil is poorly suited to septic tank absorption fields because of moderately slow permeability and wetness. Shrinking and swelling, low soil strength, and wetness can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations.

This map unit is in capability subclasses IIIs, nonirrigated, and IIs, irrigated. It is in Clayey range site, 10- to 14-inch precipitation zone.

103—Lohler silty clay. This deep, moderately well drained soil is on terraces and flood plains of the Missouri and Redwater Rivers. The soil is in the northeastern part of the county. It formed in alluvium. Slope is 0 to 2 percent. Slopes are mainly more than 1,000 feet long. Elevation is 1,900 to 2,600 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Havrelon and Trembles soils. These areas do not adversely affect the use and management of this unit as rangeland and for nonirrigated and irrigated farming.

Typically, this Lohler soil has a surface layer of grayish brown silty clay 5 inches thick. The underlying material to a depth of 60 inches or more is light brownish gray silty clay and thin strata of silt loam.

Permeability is moderately slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 30 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate. This soil is calcareous throughout. It has a water table at a depth of 4 to 6 feet during the irrigation season. The soil is subject to rare periods of floodng during prolonged, high intensity storms and during the spring runoff.

This soil is used mainly for nonirrigated and irrigated farming. It is also used as rangeland. The main nonirrigated and irrigated crops are wheat, oats, and barley. Irrigated alfalfa hay is also grown. If this soil is irrigated, it is prime farmland.

Cropland.—This soil is suited to nonirrigated and irrigated crops. It is limited mainly by the hazard of soil blowing and the silty clay texture of the surface layer. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, and stubble mulch tillage reduce soil blowing. This soil is difficult to till when dry, and it is subject to clodding and compaction if it is tilled when wet. The content of soil moisture is optimum for tillage for only a short period.

In summer, irrigation is required for maximum production of most crops. Sprinkler irrigation is the most suitable method of applying water. Use of this method permits the even, controlled application of water, reduces runoff, and minimizes the risk of erosion.

Rangeland.—The potential native plant community is mainly western wheatgrass, green needlegrass, thickspike wheatgrass, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of Sandberg bluegrass, blue grama, silver sagebrush, and perennial forbs increases. If excessive grazing continues, plants such as Kentucky bluegrass, annuals, and weedlike forms by invade. The potential native plant community produces about 2,000 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,400 pounds in years of below-normal precipitation.

Rangeland seedling of native plants or adapted grasses and legumes is a suitable practice. Areas of deteriorated rangeland can be improved by mechanical treatment practices such as shallow chiseling or scalping.

Windbreaks.—This soil is well suited to windbreaks. Suitable trees for planting are Russian-olive, white willow, golden willow, Siberian elm, Siberian crabapple, black hawthorn, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and western sandcherry.

Homesite development.—This soil is poorly suited to homesite development because of the hazard of rare flooding.

This map unit is in capability subclasses IIIs, nonirrigated, and IIs, irrigated. It is in Clayey range site, 10- to 14-inch precipitation zone.

104—Lohler silty clay, protected. This deep, moderately well drained soil is on high terraces of the Missouri River. The soil is in the northeastern part of the county. It formed in alluvium. Slope is 0 to 2 percent. Slopes are mainly more than 1,000 feet long. Elevation

is 1,900 to 2,100 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Havrelon and Trembles soils. These areas do not adversely affect the use and management of this unit as rangeland and for nonirrigated and irrigated farming.

Typically, this Lohler soil has a surface layer of grayish brown silty clay 5 inches thick. The underlying material to a depth of 60 inches or more is light brownish gray silty clay and thin strata of silt loam.

Permeability is moderately slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 30 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate. This soil is calcareous throughout. It has a water table at a depth of 4 to 6 feet during the irrigation season. The soil is protected from flooding by Fort Peck Dam.

This soil is used mainly for nonirrigated and irrigated farming. It is also used as rangeland. The main nonirrigated and irrigated crops are wheat, oats, and barley. Irrigated alfalfa hay is also grown. If this soil is irrigated, it is prime farmland.

Cropland.—This soil is suited to nonirrigated and irrigated crops. It is limited mainly by the hazard of soil blowing and the silty clay texture of the surface layer. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, and stubble mulch tillage reduce soil blowing. This soil is difficult to till when dry, and it is subject to clodding and compaction if it is tilled when wet. The content of soil moisture is optimum for tillage for only a short period.

In summer, irrigation is required for maximum production of most crops. Sprinkler irrigation is the most suitable method of applying water. Use of this method permits the even, controlled application of water, reduces runoff, and minimizes the risk of erosion.

Rangeland.—The potential native plant community is mainly western wheatgrass, green needlegrass, thickspike wheatgrass, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of blue grama, silver sagebrush, and fringed sagewort increases. If excessive grazing continues, plants such as Kentucky bluegrass, thistles, and annuals may invade. The potential native plant community produces about 1,800 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,000 pounds in years of below-normal precipitation.

Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Areas of deteriorated rangeland can be improved by mechanical treatment practices such as shallow chiseling and scalping. In places, control of silver sagebrush improves production of desirable forage plants.

Windbreaks.—This soil is well suited to windbreaks. Suitable trees for planting are Russian-olive, white willow, golden willow, Siberian elm, Siberian crabapple, black hawthorn, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and western sandcherry.

Woodland.—This soil is suited to plains cottonwood. The site index for plains cottonwood is 65. The potential annual production (CMAI) per acre is about 30 cubic feet or 160 board feet (Scribner rule). Potential production is for an even-aged, fully stocked stand of trees.

The main limitations for timber management are the difficulty of reestablishing stands of plains cottonwood and susceptibility of the soil to compaction. The understory vegetation competes vigorously with tree seedlings for the limited amount of available water. Shelterwood and selection silvicultural harvesting systems improve regeneration. Immediate site preparation and planting after harvest also may help.

The soil has low strength when wet, which results in poor trafficability and the possibility of soil compaction when heavy equipment is used to yard logs. Operating equipment only when the soil is dry or frozen can overcome this limitation.

Where this soil is forested, the composition and yield of the plants in the forest understory are different from those of plants on rangeland. Yield is reduced as the overstory tree canopy increases. The potential native forest understory plants beneath a fully stocked stand of plains cottonwood are western wheatgrass, green needlegrass, rose, snowberry, common chokecherry, prairie junegrass, poison-ivy, American licorice, green ash, Saskatoon serviceberry, redosier dogwood, and silver buffaloberry.

Homesite development.—This soil is poorly suited to homesite development. It is limited mainly by moderately slow permeability, shrink-swell potential, wetness, and low soil strength. Wetness can be reduced by installing drain tile around footings. If buildings are constructed on this soil, properly designing foundations and footings and diverting runoff away from buildings help to prevent structural damage as a result of shrinking and swelling. The soil is poorly suited to septic tank absorption fields because of the moderately slow permeability and wetness. Shrinking and swelling, low soil strength, and wetness can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations.

This map unit is in capability subclasses IIIs, nonirrigated, and IIs, irrigated. It is in Clayey range site, 10- to 14-inch precipitation zone.

105—Lonna silty clay loam, 0 to 4 percent slopes. This deep, well drained soil is on terraces and fans in the west-central and southwestern parts of the county. It formed in alluvium. Slopes are mainly 250 to more than 1,000 feet long. Elevation is 1,900 to 2,600 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Alona, Floweree, Cambeth, and Havre soils. The moderately salt-affected and strongly sodium-affected Alona soils are on fans and terraces. The high content of salts and sodium reduces the availability of moisture and plant nutrients and restricts the penetration of roots and moisture. The Havre soils are subject to flooding during runoff in spring. The Floweree and Cambeth soils do not adversely affect the use and management of this unit as rangeland and for nonirrigated farming.

Typically, this Lonna soil, where mixed to a depth of 7 inches, has a surface layer of brown silty clay loam. The subsoil is brown and very pale brown silty clay loam 9 inches thick. The substratum to a depth of 60 inches or more is very pale brown silt loam.

Permeability is moderate, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 24 inches. Runoff is slow to medium, and the hazard of water erosion is slight to moderate. The hazard of soil blowing is high. This soil is calcareous throughout.

This soil is used as rangeland and for nonirrigated farming. The main nonirrigated crops are wheat, oats, and barley.

Cropland.—This soil is well suited to nonirrigated crops. It is limited mainly by the hazards of water erosion and soil blowing. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, stubble mulch tillage, and grassed waterways reduce soil blowing and water erosion. Crops respond to phosphate and nitrogen fertilizer.

Rangeland.—The potential native plant community is mainly western wheatgrass, green needlegrass, little bluestem, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, perennial short grasses, threadleaf sedge, fringed sagewort, silver sagebrush, and perennial forbs increases. If excessive grazing continues, plants such as annuals, weedlike forbs, and Kentucky bluegrass may invade. The potential native plant community produces about 1,800 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,200 pounds in years of below-normal precipitation.

The surface layer is susceptible to water erosion and soil blowing if it is disturbed or the range is overgrazed. Proper grazing use insures good plant vigor and adequate plant cover. Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Areas of deteriorated rangeland can be improved by mechanical treatment practices such as shallow chiseling and scalping.

Windbreaks.—This soil is suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian elm, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, and skunkbush sumac.

Homesite development.—This soil is poorly suited to homesite development. It is limited mainly by low soil strength, shrink-swell potential, and moderate permeability. In the construction of basements or foundations for dwellings, the limitation of shrink-swell potential can be overcome by backfilling with suitable material that has low shrink-swell potential. If this soil is used for septic tank absorption fields, use of gravel backfill in the absorption line trench, excavated to a suitable depth, helps to compensate for the limitation of moderate permeability. In places, excavation for roads can expose material that is highly susceptible to soil blowing. Shrinking and swelling and low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations.

This map unit is in capability subclass IIIe, nonirrigated. It is in Silty range site, 10- to 14-inch precipitation zone.

106—Lonna-Havre-Glendive complex, 0 to 2 percent slopes. This map unit is on terraces and flood plains along creeks in the western part of the county. Slopes are mainly less than 1,000 feet long. Elevation is 1,900 to 2,600 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

This unit is about 25 percent Lonna silty clay loam, 25 percent Havre silt loam, and 25 percent Glendive sandy loam. The Havre and Glendive soils are on low terraces and flood plains, and the Lonna soil is on high terraces.

Included in this unit are small areas of Alona soils and Typic Fluvaquents, saline. Also included are small areas of soils on short, steep slopes along terrace edges. Included areas make up about 25 percent of the total acreage. The moderately salt-affected and strongly sodium-affected Alona soils are on terraces. The high content of salts and sodium reduces the availability of moisture and plant nutrients and restricts the penetration of roots and moisture. Typic Fluvaquents, saline, are in stream channels. They are wet, are highly saline, and are subject to occasional flooding.

The Lonna soil is deep and well drained. It formed in alluvium. Typically, the surface layer, where mixed to a depth of 7 inches, is brown silty clay loam. The subsoil is brown and very pale brown silty clay loam 9 inches thick. The substratum to a depth of 60 inches or more is very pale brown silt loam.

Permeability is moderate, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 24 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high. This soil is calcareous throughout.

The Havre soil is deep and well drained. It formed in alluvium. Typically, the surface layer is light brownish gray silt loam 5 inches thick. The underlying material to a depth of 60 inches or more is light brownish gray silt loam and thin strata of fine sandy loam.

Permeability is moderate, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 24 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate. This soil is calcareous throughout. It is subject to occasional periods of flooding during prolonged, high intensity storms and during the spring runoff.

The Glendive soil is deep and well drained. It formed in alluvium. Typically, the surface layer is grayish brown sandy loam 6 inches thick. The underlying material to a depth of 60 inches or more is stratified, grayish brown loam and white sandy loam.

Permeability is moderately rapid, and available water capacity is moderate. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 30 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high. This soil is calcareous below a depth of 6 inches. It is subject to occasional periods of flooding during prolonged, high intensity storms and during the spring runoff.

These soils are used for nonirrigated and irrigated farming and as rangeland. The main nonirrigated and irrigated crops are wheat, oats, and barley. Irrigated alfalfa hay is also grown.

Cropland.—These soils are suited to nonirrigated and irrigated crops. They are limited mainly by the hazard of soil blowing and by the hazard of occasional flooding on the Glendive and Havre soils. The surface layer of these soils is low in organic matter content. Using green manure crops, barnyard manure, and crop residue increases the organic matter content and fertility of these soils. Crops respond well to the application of phosphorus and nitrogen. Flooding may delay planting. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, and stubble mulch tillage reduce soil blowing.

In summer, irrigation is required for maximum production of most crops. Sprinkler irrigation is the most suitable method of applying water. Use of this method permits the even, controlled application of water, reduces runoff, and minimizes the risk of erosion.

Rangeland.—The potential native plant community on the Lonna soil is mainly western wheatgrass, green needlegrass, little bluestem, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, perennial short grasses, silver sagebrush, and fringed sagewort increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,800 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,200 pounds in years of below-normal precipitation.

The potential native plant community on the Havre soil is mainly western wheatgrass, green needlegrass, little bluestem, big bluestem, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, perennial short grasses, silver sagebrush, and perennial forbs increases. If excessive grazing continues, plants such as annuals, weedlike forbs, and Kentucky bluegrass may invade. The potential native plant community produces about 2,000 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,200 pounds in years of below-normal precipitation.

The potential native plant community on the Glendive soil is mainly prairie sandreed, little bluestem, big bluestem, and thickspike wheatgrass. If the range is excessively grazed, the proportion of prairie sandreed, little bluestem, and big bluestem decreases and the proportion of thickspike wheatgrass, needleandthread, perennial short grasses, and silver sagebrush increases. If excessive grazing continues, plants such as annuals, weedlike forbs, and Kentucky bluegrass may invade. The potential native plant community produces about 2,000 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,200 pounds in years of below-normal precipitation.

Grazing should be delayed until the soil has drained sufficiently and is firm enough to withstand trampling by livestock. Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Areas of deteriorated rangeland can be improved by mechanical treatment practices such as shallow chiseling and scalping. If the plant cover is disturbed for seeding or mechanical treatment, protection from flooding may be needed to control gullying and sheet erosion until the plant cover is sufficiently reestablished. Brush control to reduce competition with desirable forage plants is a suitable practice. Forage yields on the Havre and Glendive soils can be increased by the use of water spreading.

Windbreaks.—The Lonna soil is suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian elm, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, and skunkbush sumac.

The Havre soil is well suited to windbreaks. Suitable trees for planting are Russian-olive, white willow, golden willow, Siberian elm, Siberian crabapple, black hawthorn,

and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and western sandcherry.

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

Homesite development.—These soils are poorly suited to homesite development. The Lonna soil is limited mainly by low soil strength, shrink-swell potential, and moderate permeability. In the construction of basements or foundations for dwellings, the limitation of shrink-swell potential can be overcome by backfilling with suitable material that has low shrink-swell potential. If this soil is used for septic tank absorption fields, use of gravel backfill in the absorption line trench, excavated to a suitable depth, helps to compensate for the limitation of moderate permeability. In places, excavation for roads can expose material that is highly susceptible to soil blowing. Shrinking and swelling and low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations.

The Havre and Glendive soils are limited for homesite development by the hazard of occasional flooding during runoff in spring.

This map unit is in capability subclasses IIIw, nonirrigated and irrigated. The Lonna and Havre soils are in Silty range site, 10- to 14-inch precipitation zone, and the Glendive soil is in Sandy range site, 10- to 14-inch precipitation zone.

107—Macar loam, 0 to 4 percent slopes. This deep, well drained soil is on fans and terraces in the eastern part of the county. It formed in alluvium. Slopes are mainly more than 1,000 feet long. Elevation is 1,900 to 3,400 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Cambert, Lisk, Barkof, and Cherry soils. The moderately deep Cambert and Barkof soils are underlain by root-limiting material at a depth of 20 to 40 inches. The Lisk and Cherry soils do not adversely affect the use and management of this unit for nonirrigated farming and as rangeland.

Typically, this Macar soil has a surface layer of brown loam 3 inches thick. The subsoil is brown and pale brown loam 13 inches thick. The upper 18 inches of the substratum is light gray and light brownish gray loam, and the lower part to a depth of 60 inches or more is light brownish gray and light yellowish brown fine sandy loam.

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

This soil is used as rangeland and for nonirrigated farming. The main nonirrigated crops are wheat, oats, and barley. If this soil is irrigated, it is prime farmland.

Cropland.—This soil is well suited to cultivated crops. It is limited mainly by the hazards of water erosion and soil blowing. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, stubble mulch tillage, and grassed waterways reduce soil blowing and water erosion. Crops respond to nitrogen and phosphorus fertilizer.

Rangeland.—The potential native plant community is mainly western wheatgrass, green needlegrass, little bluestem, bluebunch wheatgrass, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, perennial short grasses, threadleaf sedge, fringed sagewort, silver sagebrush, and perennial forbs increases. If excessive grazing continues, plants such as annuals, weedlike forbs, and Kentucky bluegrass may invade. The potential native plant community produces about 1,800 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,200 pounds in years of below-normal precipitation.

The surface layer is susceptible to water erosion and soil blowing if it is disturbed or the range is overgrazed. Proper grazing use insures good plant vigor and adequate plant cover. Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Areas of deteriorated rangeland can be improved by mechanical treatment practices such as shallow chiseling and scalping.

Windbreaks.—This soil is suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian elm, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, and skunkbush sumac.

Homesite developmant.—This soil is suited to homesite development. It is limited mainly by moderate permeability and low soil strength. If the soil is used for septic tank absorption fields, the limitation of moderate permeability can be overcome by increasing the size of the absorption field or by excavating the trench to a suitable depth. The field or trench should be backfilled with gravel. Low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome this limitation.

This map unit is in capability subclass IIIe, nonirrigated. It is in Silty range site, 10- to 14-inch precipitation zone.

108—Macar loam, 4 to 8 percent slopes. This deep, well drained soil is on fans in the eastern part of the county. It formed in alluvium. Slopes are mainly 250 feet to more than 1,000 feet long. Elevation is 1,900 to 3,400 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Lisk, Dast, Cambert, Barkof, and Zahill soils. The Dast, Cambert, and Barkof soils are on the sides and tops of low hills. They have root-limiting material at a depth of 20 to 40 inches. The Lisk and Zahill soils do not adversely affect the use and management of this unit as rangeland and for nonirrigated farming.

Typically, this Macar soil has a surface layer of brown loam 3 inches thick. The subsoil is mostly pale brown loam 13 inches thick. The upper 18 inches of the substratum is mostly light gray loam, and the lower part to a depth of 60 inches or more is mostly light brownish gray fine sandy loam.

Permeability is moderate, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 30 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

This soil is used as rangeland and for nonirrigated farming. The main nonirrigated crops are wheat, oats, and barley.

Cropland.—This soil is well suited to cultivated crops. It is limited mainly by the hazards of water erosion and soil blowing. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, stubble mulch tillage, and grassed waterways reduce soil blowing and water erosion. The surface layer of the soil has low organic matter content. Using green manure crops, barnyard manure, and crop residue increases the organic matter content and fertility of the soil. Crops respond well to the application of phosphorus and nitrogen.

Rangeland.—The potential native plant community is mainly western wheatgrass, green needlegrass, little bluestem, bluebunch wheatgrass, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, perennial short grasses, threadleaf sedge, fringed sagewort, silver sagebrush, and perennial forbs increases. If excessive grazing continues, plants such as annuals, weedlike forbs, and Kentucky bluegrass may invade. The potential native plant community produces about 1,800 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,200 pounds in years of below-normal precipitation.

The surface layer is susceptible to water erosion and soil blowing if it is disturbed or the range is overgrazed. Proper grazing use insures good plant vigor and adequate plant cover. Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Areas of deteriorated rangeland can be improved by mechanical treatment practices such as shallow chiseling and scalping.

Windbreaks.—This soil is suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian elm, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, and skunkbush sumac.

Homesite development.—This soil is suited to homesite development. It is limited mainly by moderate permeability and low soil strength. If the soil is used for septic tank absorption fields, the limitation of moderate permeability can be overcome by increasing the size of the absorption field or by excavating the trench to a suitable depth. The field or trench should be backfilled with gravel. Low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome this limitation.

This map unit is in capability subclass IIIe, nonirrigated. It is in Silty range site, 10- to 14-inch precipitation zone.

109—Macar loam, 8 to 15 percent slopes. This deep, well drained soil is on fans and hillsides in the eastern part of the county. It formed in alluvium. Slopes are mainly less than 250 feet long. Elevation is 1,900 to 3,400 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Cabba, Dast, Barkof, and Zahill soils. The Dast and Barkof soils are on the upper side slopes and tops of hills. These soils are underlain by root-limiting material at a depth of 20 to 40 inches. The Cabba soils are on the tops of hills and ridges and are underlain by root-limiting material at a depth of 10 to 20 inches. The Zahill soils do not adversely affect the use and management of this unit as rangeland and for nonirrigated farming.

Typically, this Macar soil has a surface layer of brown loam 3 inches thick. The subsoil is mostly pale brown loam 13 inches thick. The upper 18 inches of the substratum is mostly light gray loam, and the lower part to a depth of 60 inches or more is mostly light brownish gray fine sandy loam.

Permeability is moderate, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 27 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

This soil is used mainly as rangeland. It is also used for nonirrigated farming. The main nonirrigated crops are wheat, oats, and barley.

Cropland.—This soil is suited to cultivated crops. It is limited mainly by the hazards of soil blowing and water

erosion. The surface layer of the soil has low organic matter content. Using green manure crops, barnyard manure, and crop residue increases the organic matter content and fertility of the soil. Crops respond well to the application of phosphorus and nitrogen. Minimum tillage, contour cultivation, stripcropping, tall grass barriers, grassed waterways, and return of crop residue to the soil reduce soil blowing and water erosion. Tall grass barriers also reduce evaporation and trap snow, which increases the amount of moisture in the soil. Return of crop residue also helps to maintain good soil tilth. Chiseling stubble fields in fall on the contour or across the slope reduces runoff and water erosion.

Rangeland.—The potential native plant community is mainly western wheatgrass, green needlegrass, little bluestem, bluebunch wheatgrass, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, perennial short grasses, threadleaf sedge, fringed sagewort, silver sagebrush, and perennial forbs increases. If excessive grazing continues, plants such as annuals, weedlike forbs, and Kentucky bluegrass may invade. The potential native plant community produces about 1,600 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,000 pounds in years of below-normal precipitation.

The surface layer is susceptible to water erosion and soil blowing if it is disturbed or the range is overgrazed. Proper grazing use insures good plant vigor and adequate plant cover. Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Areas of deteriorated rangeland can be improved by mechanical treatment practices such as shallow chiseling and scalping. Conducting fieldwork on the contour or across the slope, where practical, reduces erosion and conserves moisture.

Windbreaks.—This soil is suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian elm, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, and skunkbush sumac.

Homesite development.—This soil is suited to homesite development. It is limited mainly by moderate permeability and low soil strength. If the soil is used for septic tank absorption fields, the limitation of moderate permeability can be overcome by increasing the size of the absorption field or by excavating the trench to a suitable depth. The field or trench should be backfilled with gravel. Slope is a concern in installing septic tank absorption fields. Absorption lines should be installed on the contour. Low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome this limitation.

This map unit is in capability subclass IVe, nonirrigated. It is in Silty range site, 10- to 14-inch precipitation zone.

110—Macar loam, saline, 0 to 4 percent slopes. This deep, well drained, salt-affected soil is on fans and terraces in the northeastern part of the county. It formed in alluvium derived from glacial till. Slopes are mainly 250 feet to more than 1,000 feet long. Elevation is 1,900 to 2,600 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Alona and Cherry soils and Havrelon soils, saline. The Alona and Havrelon soils are on terraces and fans. They are strongly salt- and sodium-affected. The salts and sodium reduce the availability of moisture and some plant nutrients, which limits crop yields. The Cherry soils do not adversely affect the use and management of this unit for nonirrigated farming and as rangeland.

Typically, this Macar soil, where mixed to a depth of 7 inches, has a surface layer of grayish brown loam. The upper 8 inches of the subsoil is grayish brown silt loam, and the lower 5 inches is grayish brown loam. The substratum to a depth of 60 inches or more is mostly stratified, olive loam and silty clay loam.

Permeability is moderate, and available water capacity is moderate. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 30 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high. This soil is moderately salt-affected at a depth of about 7 inches. It is calcareous throughout.

This soil is used mainly as rangeland. It is also used for nonirrigated farming. The main nonirrigated crops are wheat, oats, and barley.

Cropland.—This soil is poorly suited to cultivated crops. It is limited mainly by the hazard of soil blowing, the content of salts, and the crusting of the surface. Returning crop residue to the soil or regularly adding other organic matter improves fertility, reduces crusting, and increases the water intake rate. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, and stubble mulch tillage reduce soil blowing.

Rangeland.—The potential native plant community is mainly western wheatgrass, green needlegrass, alkali bluegrass, and Nuttall saltbush. If the range is excessively grazed, the proportion of these plants decreases and the proportion of inland saltgrass, needleandthread, perennial short grasses, fringed sagewort, and perennial forbs increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,600 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,000 pounds in years of below-normal precipitation.

Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Areas of deteriorated rangeland can be improved by mechanical

treatment practices such as shallow chiseling, scalping, contour furrowing, and subsoiling.

Windbreaks.—This soil is suited to windbreaks. It is moderately salt-affected, however, which limits the choice of trees and shrubs to those that are salt-tolerant. Suitable trees for planting are Russian-olive, black hawthorn, Siberian elm, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, common chokecherry, skunkbush sumac, and silver buffaloberry.

Homesite development.—This soil is poorly suited to homesite development. It is limited mainly by moderate permeability and low soil strength. If the soil used for septic tank absorption fields, the limitation of moderate permeability can be overcome by increasing the size of the absorption field or by excavating the trench to a suitable depth. The field or trench should be backfilled with gravel. Low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome this limitation.

This map unit is in capability subclass IVe, nonirrigated. It is in Silty range site, 10- to 14-inch precipitation zone.

111—Macar-Cabba loams, 8 to 15 percent slopes. This map unit is on hills and ridges in the eastern part of the county. Slopes are mainly less than 250 feet long. Elevation is 1,900 to 3,400 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

This unit is about 50 percent Macar loam and 35 percent Cabba loam. The Macar soil is on fans and the lower side slopes, and the Cabba soil is on the upper side slopes and tops of hills and ridges.

Included in this unit are small areas of Dast, Barkof, Zahill, and Lisk soils. Included areas make up about 15 percent of the total acreage. The Dast and Barkof soils are on the upper side slopes and are underlain by root-limiting material at a depth of 20 to 40 inches. The Zahill and Lisk soils do not adversely affect the use and management of this unit as rangeland and for nonirrigated farming.

The Macar soil is deep and well drained. It formed in alluvium. Typically, the surface layer is brown loam 3 inches thick. The subsoil is mostly pale brown loam 13 inches thick. The upper 18 inches of the substratum is mostly light gray loam, and the lower part to a depth of 60 inches or more is mostly light brownish gray fine sandy loam.

Permeability is moderate, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 27 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

The Cabba soil is shallow and well drained. It formed in material derived from weakly consolidated, sandy and silty sedimentary beds. Typically, the surface layer is light yellowish brown loam 5 inches thick. The underlying material to a depth of 15 inches is light yellowish brown and pale yellow loam. Below this to a depth of 60 inches or more are pale yellow, weakly consolidated, sandy and silty sedimentary beds. Sedimentary beds are at a depth of 10 to 20 inches.

Permeability is moderate, and available water capacity is very low. Effective rooting depth is limited by the sedimentary beds at a depth of 10 to 20 inches. Where this soil is under native vegetation, the average annual wetting depth is 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is high. This soil is calcareous throughout. It is droughty.

These soils are used mainly as rangeland. They are also used for nonirrigated farming. The main nonirrigated crops are wheat, oats, and barley.

Cropland.—These soils are poorly suited to cultivated crops. They are limited mainly by the hazards of water erosion and soil blowing and by the droughtiness of the Cabba soil. The Cabba soil can be farmed around. Minimum tillage, contour cultivation, stripcropping, tall grass barriers, grassed waterways, and return of crop residue to the soil reduce soil blowing and water erosion. Tall grass barriers also reduce evaporation and trap snow, which increases the amount of moisture in the soil. Return of crop residue also helps to maintain good soil tilth. Chiseling stubble fields in fall on the contour or across the slope reduces runoff and water erosion.

Rangeland.—The potential native plant community on the Macar soil is mainly western wheatgrass, green needlegrass, little bluestem, bluebunch wheatgrass, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, perennial short grasses, threadleaf sedge, fringed sagewort, silver sagebrush, and perennial forbs increases. If excessive grazing continues, plants such as annuals, weedlike forbs, and Kentucky bluegrass may invade. The potential native plant community produces about 1,600 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,000 pounds in years of below-normal precipitation.

The potential native plant community on the Cabba soil is mainly bluebunch wheatgrass, western wheatgrass, little bluestem, plains muhly, and needleandthread. If the range is excessively grazed, the proportion of bluebunch wheatgrass, western wheatgrass, little bluestem, and plains muhly decreases and the proportion of needleandthread, perennial short grasses, threadleaf sedge, and perennial forbs increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,200 pounds per acre of air-dry vegetation in years of above-normal

precipitation and 700 pounds in years of below-normal precipitation.

The surface layer of these soils is susceptible to water erosion and soil blowing if it is disturbed or the range is overgrazed. Proper grazing use insures good plant vigor and adequate plant cover. Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Areas of deteriorated rangeland can be improved by mechanical treatment practices such as shallow chiseling and scalping. Conducting fieldwork on the contour or across the slope, where practical, reduces erosion and conserves moisture.

Windbreaks.—The Macar soil is suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian elm, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, and skunkbush sumac.

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

Homesite development.—These soils are poorly suited to homesite development. The Macar soil is limited mainly by moderate permeability and low soil strength. If this soil is used for septic tank absorption fields, the limitation of moderate permeability can be overcome by increasing the size of the absorption field or by excavating the trench to a suitable depth. The field or trench should be backfilled with gravel. Slope is a concern in installing septic tank absorption fields. Absorption lines should be installed on the contour. Low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome this limitation.

The Cabba soil is limited mainly by low soil strength and slow permeability of the underlying sedimentary beds. Low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome this limitation. This soil is poorly suited to septic tank absorption fields because of the slow permeability of the underlying sedimentary beds.

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

112—Macar-Cambert loams, 2 to 8 percent slopes. This map unit is on hills and ridges in the east-central and southeastern parts of the county. Slopes are mainly 250 to 1,000 feet long. Elevation is 1,900 to 3,400 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

This unit is about 40 percent Macar loam and 40 percent Cambert loam. The Macar soil is on fans and the lower side slopes of hills and ridges, and the Cambert soil is on the upper side slopes and tops of hills and ridges.

Included in this unit are small areas of Dast, Barkof, and Shambo soils. Included areas make up about 20 percent of the total acreage. The Dast and Barkof soils are on the upper side slopes and tops of hills. They are underlain by root-limiting material at a depth of 20 to 40 inches. The Shambo soils do not adversely affect the use and management of this unit as rangeland and for nonirrigated farming.

The Macar soil is deep and well drained. It formed in alluvium. Typically, the surface layer is brown loam 3 inches thick. The subsoil is mostly pale brown loam 13 inches thick. The upper 18 inches of the substratum is mostly light gray loam, and the lower part to a depth of 60 inches or more is mostly light brownish gray fine sandy loam.

Permeability is moderate, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 27 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

The Cambert soil is moderately deep and well drained. It formed in material derived from weakly consolidated, silty sedimentary beds. Typically, the surface layer is brown loam 4 inches thick. The subsoil is mostly brown loam 9 inches thick. The substratum to a depth of 26 inches is very pale brown silty clay loam. Below this to a depth of 60 inches or more are pale yellow and light gray, weakly consolidated, silty sedimentary beds. Sedimentary beds are at a depth of 20 to 40 inches.

Permeability is moderate, and available water capacity is moderate. Effective rooting depth is limited by the sedimentary beds at a depth of 20 to 40 inches. Where this soil is under native vegetation, the average annual wetting depth is 20 to 30 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate. This soil is calcareous below a depth of 9 inches.

These soils are used for nonirrigated farming and as rangeland. The main nonirrigated crops are wheat, oats, and barley.

Cropland.—These soils are suited to cultivated crops. They are limited mainly by the hazards of soil blowing and water erosion. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, stubble mulch tillage, and grassed waterways reduce soil blowing and water erosion.

Rangeland.—The potential native plant community on these soils is mainly western wheatgrass, green needlegrass, little bluestem, bluebunch wheatgrass, and

winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, perennial short grasses, threadleaf sedge, fringed sagewort, silver sagebrush, and perennial forbs increases. If excessive grazing continues, plants such as annuals, weedlike forbs, red threeawn, and Kentucky bluegrass may invade. The potential native plant community on the Macar soil produces about 1,800 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,200 pounds in years of below-normal precipitation. On the Cambert soil, it produces about 1,600 pounds per acre in years of above-normal precipitation and 1,000 pounds in years of below-normal precipitation.

The surface layer is susceptible to water erosion and soil blowing if it is disturbed or the range is overgrazed. Proper grazing use insures good plant vigor and adequate plant cover. Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Areas of deteriorated rangeland can be improved by mechanical treatment practices such as shallow chiseling and scalping.

Windbreaks.—These soils are suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian elm, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, and skunkbush sumac.

Homesite development.—These soils are poorly suited to homesite development. The Macar soil is limited mainly by moderate permeability and low soil strength. If this soil is used for septic tank absorption fields, the limitation of moderate permeability can be overcome by increasing the size of the absorption field or by excavating the trench to a suitable depth. The field or trench should be backfilled with gravel. Low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome this limitation.

The Cambert soil is limited mainly by low soil strength and slow permeability of the underlying sedimentary beds. This soil is poorly suited to septic tank absorption fields because of the slow permeability of the underlying sedimentary beds. Deep cuts needed to provide nearly level road surfaces can expose soft sedimentary beds that can easily be excavated. Low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome this limitation.

This map unit is in capability subclass IIIe, nonirrigated. It is in Silty range site, 10- to 14-inch precipitation zone.

113—Marias clay. This deep, well drained soil is on fans and terraces in the central and northwestern parts of the county. It formed in clayey alluvium. Slope is 0 to 2 percent. Slopes are mainly 250 feet to more than 1,000 feet long. Elevation is 1,900 to 2,600 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Marvan, Bascovy, and Harlem soils. The moderately salt- and sodium-affected Marvan soils are on fans. The content of salts and sodium reduces the availability of moisture and plant nutrients and restricts the penetration of roots and moisture into the subsoil. These characteristics limit crop yields. The moderately deep Bascovy soils are on the upper part of fans and on foot slopes. The consolidated shale that underlies these soils restricts penetration of roots. The Harlem soils do not adversely affect the use and management of this unit as rangeland and for nonirrigated crops.

Typically, this Marias soil, where mixed to a depth of 7 inches, has a surface layer of grayish brown clay. The underlying material to a depth of 60 inches or more is grayish brown clay.

Permeability is very slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 24 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate. The soil is calcareous throughout.

This soil is used mainly as rangeland and for nonirrigated crops. The main nonirrigated crops are wheat, oats, and barley.

Cropland.—This soil is well suited to nonirrigated crops. It is limited mainly by the hazard of soil blowing. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, and stubble mulch tillage reduce soil blowing. Crops respond to nitrogen and phosphate fertilizer.

Rangeland.—The potential native plant community is mainly western wheatgrass, green needlegrass, thickspike wheatgrass, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of Sandberg bluegrass, blue grama, big sagebrush, and perennial forbs increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 2,000 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,200 pounds in years of below-normal precipitation.

Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Areas of deteriorated rangeland can be improved by mechanical treatment practices such as shallow chiseling and scalping.

Windbreaks.—This soil is well suited to windbreaks. Suitable trees for planting are Russian-olive, white willow, golden willow, Siberian elm, Siberian crabapple, black hawthorn, and Rocky Mountain juniper. Suitable

shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and western sandcherry.

Homesite development.—This soil is poorly suited to homesite development. It is limited mainly by very slow permeability, potential for shrinking and swelling, and low soil strength. If buildings are constructed on this soil, properly designing foundations and footings and diverting runoff away from buildings help to prevent structural damage as a result of shrinking and swelling. The soil is poorly suited to septic tank absorption fields because of the very slow permeability. Shrinking and swelling and low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations.

This map unit is in capability subclass IIIe, nonirrigated. It is in Clayey range site, 10- to 14-inch precipitation zone.

114—Marvan clay, 0 to 8 percent slopes. This deep, well drained, salt- and sodium-affected soil is on fans and foot slopes in the northern part of the county. It formed in alluvium. Slopes are mainly 250 to 1,000 feet long. Elevation is 1,900 to 2,600 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Vanda, Marias, and Gerdrum soils. The Vanda soils are on the upper parts of fans and foot slopes, below shale outcroppings. These soils are strongly salt- and sodium-affected, which reduces the penetration of roots and moisture and thus limits crop yields. The Marias and Gerdrum soils do not adversely affect the use and management of this unit as rangeland and for nonirrigated farming.

Typically, this Marvan soil has a surface layer of grayish brown clay 4 inches thick. The upper 31 inches of the underlying material is grayish brown and olive clay, and the lower part to a depth of 60 inches or more is light yellowish brown silty clay loam and thin strata of silt loam and fine sandy loam.

Permeability is very slow, and available water capacity is moderate. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 24 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high. This soil is calcareous throughout. It is moderately salt- and sodium-affected at a depth of about 4 inches.

This soil is used mainly as rangeland. It is also used for nonirrigated farming. The main nonirrigated crops are wheat, oats, and barley.

Cropland.—This soil is poorly suited to nonirrigated crops. It is limited mainly by the hazards of water erosion and soil blowing, the clay surface layer, and the salt- and sodium-affected underlying material.

This soil is difficult to till when dry, and it is subject to clodding and compaction if it is tilled when wet. The content of soil moisture is optimum for tillage for only a short period. The salts and sodium in the underlying material reduce the availability of moisture and restrict root penetration. Keeping tillage at a minimum not only helps to maintain the tilth of the surface layer but also increases water infiltration and reduces the risk of erosion. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, stubble mulch tillage, and grassed waterways reduce soil blowing and water erosion.

Rangeland.—The potential native plant community is mainly western wheatgrass, green needlegrass, thickspike wheatgrass, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of Sandberg bluegrass, blue grama, big sagebrush, and perennial forbs increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 950 pounds per acre of air-dry vegetation in years of above-normal precipitation and 600 pounds in years of below-normal precipitation.

The surface layer is susceptible to water erosion and soil blowing if it is disturbed or the range is overgrazed. Proper grazing use insures good plant vigor and adequate plant cover. Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Areas of deteriorated rangeland can be improved by mechanical treatment practices such as shallow chiseling, scalping, and contour furrowing.

Windbreaks.—This soil is suited to windbreaks. It is moderately salt-affected, which limits the choice of trees and shrubs to those that are salt-tolerant. Suitable trees for planting are Russian-olive, black hawthorn, Siberian elm, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, common chokecherry, skunkbush sumac, and silver buffaloberry.

Homesite development.—This soil is poorly suited to homesite development. It is limited mainly by the very slow permeability, shrink-swell potential, and low soil strength. Buildings can be designed to offset the effects of shrinking and swelling. The soil is poorly suited to septic tank absorption fields because of the very slow permeability. Shrinking and swelling and low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. Access roads should be designed to control surface runoff and help stabilize cut slopes.

This map unit is in capability subclass IVs, nonirrigated. It is in Clayey range site, 10- to 14-inch precipitation zone.

115—Neldore-Badland-Bascovy complex, 15 to 45 percent slopes. This map unit is on uplands in the

northwestern part of the county. Slopes are mainly less than 250 feet long. Elevation is 1,900 to 2,600 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

This unit is about 40 percent Neldore clay, 30 percent Badland, and 20 percent Bascovy silty clay. The steep Neldore soil is on the upper side slopes and tops of hills and ridges, and the moderately steep Bascovy soil is on side slopes and fans. The areas of Badland are on hills, ridges, escarpments, and side slopes of deep coulees.

Included in this unit are small areas of Sunburst, Vanda, and Yamac soils. Also included are small areas of soils that have slopes of less than 15 percent. Included areas make up about 10 percent of the total acreage. These areas do not adversely affect the use and management of this unit as rangeland.

The Neldore soil is shallow and well drained. It formed in material derived from consolidated shale. Typically, the surface layer is grayish brown clay 5 inches thick. The underlying material to a depth of 17 inches is grayish brown clay. Below this to a depth of 60 inches or more is olive gray consolidated shale. Consolidated shale is at a depth of 10 to 20 inches.

Permeability is slow, and available water capacity is very low. Effective rooting depth is limited by the consolidated shale at a depth of 10 to 20 inches. Where this soil is under native vegetation, the average annual wetting depth is 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate. This soil is droughty.

Badland consists of barren and nearly barren areas on the tops of hills and ridges, on escarpments, and in deeply entrenched coulees. These areas were formed by the active geologic erosion of consolidated shale. Runoff is very rapid, and the hazard of water erosion is very high. The hazard of soil blowing is moderate.

The Bascovy soil is moderately deep and well drained. It formed in material derived from consolidated shale. Typically, the surface layer is grayish brown silty clay 2 inches thick. The subsoil is grayish brown silty clay 9 inches thick. The substratum to a depth of 23 inches is grayish brown silty clay. Below this to a depth of 60 inches or more is olive gray consolidated shale. Consolidated shale is at a depth of 20 to 40 inches.

Permeability is very slow, and available water capacity is low. Effective rooting depth is limited by the consolidated shale at a depth of 20 to 40 inches. Where this soil is under native vegetation, the average annual wetting depth is about 20 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate. This soil is droughty.

This unit is used as rangeland.

Cropland.—This soil is not suited to cultivated crops because of the steepness of slope.

Rangeland.—The potential native plant community on the Neldore soil is mainly prairie sandreed, little bluestem, bluebunch wheatgrass, and sun sedge. If the range is excessively grazed, the proportion of these plants decreases and the proportion of perennial short grasses, longleaf sagebrush, prairie rose, rubber rabbitbrush, and skunkbush sumac increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,100 pounds per acre of air-dry vegetation in years of above-normal precipitation and 500 pounds in years of below-normal precipitation.

The potential native plant community on the Bascovy soil is mainly western wheatgrass, green needlegrass, bluebunch wheatgrass, and sideoats grama. If the range is excessively grazed, the proportion of these grasses decreases and the proportion of perennial short grasses, juniper, perennial forbs, and big sagebrush increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,300 pounds per acre of air-dry vegetation in years of above-normal precipitation and 850 pounds in years of below-normal precipitation.

Steepness of slope limits access by livestock and promotes overgrazing of the less sloping areas of this unit. Use of mechanical treatment practices is not practical. The soils in the unit are not suited to rangeland seeding because of the steepness of slope.

Windbreaks.—This unit is not suited to windbreaks because of the steepness of slope.

Homesite development.—This unit is poorly suited to homesite development because of the steepness of slope, the shallow depth to consolidated shale in the Neldore soil, the moderate depth to consolidated shale in the Bascovy soil, and the areas of Badland.

This map unit is in capability subclass VIIe, nonirrigated. The Neldore soil is in Coarse Clay range site, 10- to 14-inch precipitation zone, and the Bascovy soil is in Thin Clayey range site, 10- to 14-inch precipitation zone.

116—Neldore-Bascovy complex, 2 to 15 percent slopes. This map unit is on uplands, mostly in the northwestern part of the county. Slopes are mainly less than 1,000 feet long. Elevation is 1,900 to 2,600 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

This unit is about 40 percent Neldore clay and 35 percent Bascovy silty clay. The gently sloping to strongly sloping Neldore soil is on the upper side slopes and tops of hills, and the gently sloping and moderately sloping Bascovy soil is on the foot slopes and side slopes of hills.

Included in this unit are small areas of Vanda and Sunburst soils and shale outcroppings. Included areas make up about 25 percent of the total acreage. The areas of soil do not adversely affect the use and

management of this unit as rangeland. The areas of shale outcroppings limit the range production of this unit.

The Neldore soil is shallow and well drained. It formed in material derived from consolidated shale. Typically, the surface layer is grayish brown clay 5 inches thick. The underlying material to a depth of 17 inches is grayish brown clay. Below this to a depth of 60 inches or more is olive gray consolidated shale. Consolidated shale is at a depth of 10 to 20 inches.

Permeability is slow, and available water capacity is very low. Effective rooting depth is limited by the consolidated shale at a depth of 10 to 20 inches. Where this soil is under native vegetation, the average annual wetting depth is 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is moderate to high. The hazard of soil blowing is moderate. This soil is droughty.

The Bascovy soil is moderately deep and well drained. It formed in material derived from consolidated shale. Typically, the surface layer is grayish brown silty clay 2 inches thick. The subsoil is grayish brown silty clay 9 inches thick. The substratum to a depth of 23 inches is grayish brown silty clay. Below this to a depth of 60 inches or more is olive gray consolidated shale. Consolidated shale is at a depth of 20 to 40 inches.

Permeability is very slow, and available water capacity is low. Effective rooting depth is limited by the consolidated shale at a depth of 20 to 40 inches. Where this soil is under native vegetation, the average annual wetting depth is about 20 inches. Runoff is medium to rapid, and the hazard of water erosion is moderate to high. The hazard of soil blowing is moderate. This soil is droughty.

These soils are used as rangeland.

Cropland.—These soils are poorly suited to cultivated crops because of droughtiness and depth to consolidated shale, which limits rooting depth.

Rangeland.—The potential native plant community on the Neldore soil is mainly prairie sandreed, little bluestem, bluebunch wheatgrass, sun sedge, and western wheatgrass. If the range is excessively grazed, the proportion of these plants decreases and the proportion of perennial short grasses, longleaf sagebrush, prairie rose, rubber rabbitbrush, and perennial forbs increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,100 pounds per acre of air-dry vegetation in years of above-normal precipitation and 500 pounds in years of below-normal precipitation.

The potential native plant community on the Bascovy soil is mainly western wheatgrass, green needlegrass, thickspike wheatgrass, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of Sandberg bluegrass, blue grama, big sagebrush, and perennial forbs increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,800 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,000 pounds in years of below-normal precipitation.

These soils are poorly suited to mechanical treatment practices because they are droughty and are susceptible to soil blowing and water erosion if they are disturbed.

Windbreaks.—The Neldore soil is not suited to windbreaks. It is limited mainly by the very low available water capacity.

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

Homesite development.—These soils are poorly suited to homesite development. The Neldore soil is limited mainly by slow permeability, shallow depth to consolidated shale, low soil strength, and shrink-swell potential. The Bascovy soil is limited mainly by very slow permeability, moderate depth to consolidated shale, low soil strength, and shrink-swell potential. In the construction of basements or foundations for dwellings, the limitation of shrink-swell potential can be overcome by backfilling with suitable material that has low shrink-swell potential. These soils are poorly suited to septic tank absorption fields because of the slow and very slow permeability and restricted depth to consolidated shale. Shrinking and swelling and low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. Access roads must be designed to control surface runoff and help stabilize cut slopes.

This map unit is in capability subclass VIs, nonirrigated. The Neldore soil is in Coarse Clay range site, 10- to 14-inch precipitation zone, and the Bascovy soil is in Clayey range site, 10- to 14-inch precipitation zone.

117—Neldore-Yamac-Badland complex, 15 to 45 percent slopes. This map unit is on uplands in the northwestern part of the county. Slopes are mainly less than 250 feet long. Elevation is 1,900 to 2,600 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

This unit is about 35 percent Neldore clay, 30 percent Yamac loam, and 25 percent Badland. The moderately steep to steep Neldore soil is on the sides and tops of hills and ridges, the moderately steep Yamac soil is on terraces, and Badland is on the tops of hills and ridges, on escarpments, and in coulees.

Included in this unit are small areas of Bascovy, Sunburst, and Fleak soils. Also included are small areas of soils that have slopes of less than 15 percent.

Included areas make up about 10 percent of the total acreage. These areas do not adversely affect the use and management of this unit as rangeland.

The Neldore soil is shallow and well drained. It formed in material derived from consolidated shale. Typically, the surface layer is grayish brown clay 5 inches thick. The underlying material to a depth of 17 inches is grayish brown clay. Below this to a depth of 60 inches or more is olive gray consolidated shale. Consolidated shale is at a depth of 10 to 20 inches.

Permeability is slow, and available water capacity is very low. Effective rooting depth is limited by the consolidated shale at a depth of 10 to 20 inches. Where this soil is under native vegetation, the average annual wetting depth is 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate. This soil is droughty.

The Yamac soil is deep and well drained. It formed in alluvium. Typically, the surface layer is grayish brown loam 4 inches thick. The upper 7 inches of the subsoil is olive loam, and the lower 8 inches is grayish brown loam. The substratum to a depth of 60 inches or more is pale olive loam.

Permeability is moderate, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 21 inches. Runoff is medium, and the hazard of water erosion is high. The hazard of soil blowing is high. This soil is calcareous throughout.

Badland consists of barren and nearly barren areas on the tops of hills and ridges, on escarpments, and in deeply entrenched coulees. These areas were formed by the active geologic erosion of consolidated shale. Runoff is very rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

This unit is used as rangeland.

Cropland.—This soil is not suited to cultivated crops because of the steepness of slope.

Rangeland.—The potential native plant community on the Neldore soil is mainly prairie sandreed, little bluestem, bluebunch wheatgrass, and sun sedge. If the range is excessively grazed, the proportion of these plants decreases and the proportion of perennial short grasses, longleaf sagebrush, prairie rose, rubber rabbitbrush, and perennial forbs increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,100 pounds per acre of air-dry vegetation in years of above-normal precipitation and 500 pounds in years of below-normal precipitation.

The potential native plant community on the Yamac soil is mainly little bluestem, bluebunch wheatgrass, sideoats grama, plains muhly, western wheatgrass, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, perennial short grasses, fringed sagewort, perennial forbs, and creeping juniper increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,400 pounds per acre of air-dry vegetation in years of above-normal precipitation and 800 pounds in years of below-normal precipitation.

Use of mechanical treatment practices is not practical on these soils. Steepness of slope limits access by livestock and promotes overgrazing of the less sloping areas.

Windbreaks.—This unit is not suited to windbreaks because of the steepness of slope.

Homesite development.—This unit is poorly suited to homesite development because of the steepness of slope, the shallow depth to consolidated shale in the Neldore soil, and the areas of Badland.

This map unit is in capability subclass VIIe, nonirrigated. The Neldore soil is in Coarse Clay range site, 10- to 14-inch precipitation zone, and the Yamac soil is in Thin Silty range site, 10- to 14-inch precipitation zone.

118—Pendroy clay. This deep, well drained soil is in oxbows and depressional areas on terraces of the Missouri River, in the northern part of the county. It formed in clayey alluvium. Slope is 0 to 2 percent. Slopes are mainly more than 1,000 feet long. Elevation is 1,900 to 2,100 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Harlem and Marias soils. These areas do not adversely affect the use and management of this unit as rangeland and for nonirrigated and irrigated farming.

Typically, the Pendroy soil has a surface layer of grayish brown clay 14 inches thick. The underlying material to a depth of 60 inches or more is grayish brown clay.

Permeability is very slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 20 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

This soil is used mainly for nonirrigated and irrigated farming. It is also used as rangeland. The main nonirrigated and irrigated crops are wheat, oats, and barley. Irrigated alfalfa hay is also grown.

Cropland.—This soil is suited to nonirrigated and irrigated crops. It is limited mainly by very slow permeability and the clay texture of the soil. The soil is difficult to till when dry, and it is subject to clodding and compaction if it is tilled when wet. The content of soil moisture is optimum for tillage for only a short period. Keeping tillage at a minimum maintains tilth of the

surface layer, increases water infiltration, and reduces the risk of erosion.

In summer, irrigation is required for maximum production of most crops. Sprinkler irrigation is the most suitable method of applying water. Use of this method permits the even, controlled application of water, reduces runoff, and minimizes the risk of erosion. Yields of hay and pasture crops can be increased by the use of water spreading. Because of the very slow permeability of the soil, the length of runs should be adjusted to permit adequate infiltration of water.

Rangeland.—The potential native plant community is mainly western wheatgrass, green needlegrass, thickspike wheatgrass, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of Sandberg bluegrass, blue grama, silver sagebrush, and perennial forbs increases. If excessive grazing continues, plants such as Kentucky bluegrass, thistles, annuals, and weedlike forbs may invade. The potential native plant community produces about 2,000 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,400 pounds in years of below-normal precipitation.

Grazing should be delayed until the soil is firm and the more desirable forage plants have achieved sufficient growth to withstand grazing pressure. Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Areas of deteriorated rangeland can be improved by mechanical treatment practices such as shallow chiseling and scalping.

Windbreaks.—This soil is well suited to windbreaks. Suitable trees for planting are Russian-olive, white willow, golden willow, Siberian elm, Siberian crabapple, black hawthorn, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and western sandcherry.

Homesite development.—This soil is poorly suited to homesite development. It is limited mainly by very slow permeability, shrink-swell potential, and low soil strength. If buildings are constructed on this soil, properly designing foundations and footings and diverting runoff away from buildings help to prevent structural damage as a result of shrinking and swelling. The soil is poorly suited to septic tank absorption fields because of the very slow permeability. Shrinking and swelling and low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations.

This map unit is in capability subclass IVs, nonirrigated and irrigated. It is in Clayey range site, 10- to 14-inch precipitation zone.

119—Ridgelawn silt loam. This deep, well drained soil is on stream terraces and flood plains in the northeastern part of the county and along the Redwater River in the southeastern part. It formed in alluvium. Slope is 0 to 2 percent. Slopes are mainly more than 1,000 feet long. Elevation is 1,900 to 2,600 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Havrelon, Trembles, and Banks soils. Also included are small areas of soils on short, steep slopes along terrace edges; these areas can be farmed around. The Havrelon, Trembles, and Banks soils do not adversely affect the use and management of this unit as rangeland and for nonirrigated and irrigated farming.

Typically, this Ridgelawn soil has a surface layer of light brownish gray silt loam 7 inches thick. The upper 17 inches of the underlying material is light brownish gray loam, and the lower part to a depth of 60 inches or more is grayish brown loamy fine sand.

Permeability is moderate to a depth of 24 inches and rapid below this depth. Available water capacity is moderate. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 24 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high. This soil is calcareous throughout. It is subject to rare periods of flooding during prolonged, high intensity storms. Channeling and deposition are common along streambanks.

This soil is used as rangeland and for nonirrigated and irrigated farming. The main nonirrigated crops are wheat, oats, and barley. The main irrigated crops are wheat, oats, barley, and alfalfa hay.

Cropland.—This soil is suited to nonirrigated and irrigated crops. It is limited mainly by the hazard of soil blowing. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, and stubble mulch tillage reduce soil blowing.

In summer, irrigation is required for maximum production of most crops. Sprinkler irrigation is the most suitable method of applying water. Use of this method permits the even, controlled application of water, reduces runoff, and minimizes the risk of erosion. Yields of hay and pasture crops can be increased by the use of water spreading. If a water spreading system is used in sloping areas, land leveling is needed for the efficient application and removal of water.

Rangeland.—The potential native plant community is mainly western wheatgrass, green needlegrass, little bluestem, bluebunch wheatgrass, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, perennial short grasses, threadleaf sedge, fringed sagewort, silver sagebrush, and perennial forbs increases. If excessive grazing continues, plants such as Kentucky bluegrass, annuals, and weedlike forbs may invade. The potential native plant community produces about 1,600 pounds per acre of air-dry vegetation in

years of above-normal precipitation and 1,000 pounds in years of below-normal precipitation.

Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Areas of deteriorated rangeland can be improved by mechanical treatment practices such as shallow chiseling and scalping. If the plant cover is disturbed for seeding or mechanical treatment, protection from flooding may be needed to control gullying and sheet erosion until the plant cover is sufficiently reestablished.

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

Homesite development.—This soil is poorly suited to homesite development because of the hazard of rare flooding.

This map unit is in capability subclasses IIIe, nonirrigated, and IIe, irrigated. It is in Silty range site, 10- to 14-inch precipitation zone.

120—Rominell loam, 0 to 8 percent slopes. This deep, well drained, salt- and sodium-affected soil is on fans and terraces in the west-central and northern parts of the county. It formed in alluvium derived from sandstone and shale. Slopes are mainly more than 1,000 feet long. Elevation is 1,900 to 2,600 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Kremlin, Gerdrum, Chinook, and Yawdim soils and Rominell soils, gullied. The nearly level to moderately sloping Rominell soils, gullied, are on fans and terraces. The many deep, narrow gullies make tillage difficult. The shallow, well drained Yawdim soils are on side slopes and on the tops of low hills. They are droughty and are low in productivity. The deep, well drained Chinook soils are on fans. They are highly susceptible to soil blowing. The Kremlin and Gerdrum soils do not adversely affect the use and management of this unit as rangeland and for nonirrigated farming.

Typically, this Rominell soil has a surface layer of grayish brown loam 4 inches thick. The subsurface layer is light brownish gray fine sandy loam 5 inches thick. The upper 6 inches of the subsoil is light brownish gray clay loam, and the lower 10 inches is light olive brown loam. The upper 29 inches of the substratum is brown clay loam, and the lower part to a depth of 60 inches or more is light olive brown loam.

Permeability is slow, and available water capacity is moderate. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 24 inches. Runoff is slow to medium, and the hazard of water erosion is slight to moderate. The hazard of soil blowing is moderate. This soil is moderately salt-affected and strongly sodium-affected at a depth of about 9 inches.

Most areas of this soil are used as rangeland. A few areas are used for nonirrigated farming. The main nonirrigated crops are wheat, oats, and barley.

Cropland.—If this soil is used for cultivated crops, it is limited mainly by the content of salts and sodium in the subsoil and the hazards of soil blowing and water erosion. The salt in the subsoil reduces the amount of moisture available for plant growth. Keeping tillage at a minimum helps to maintain tilth of the surface layer, increases water infiltration, and reduces the risk of erosion. Chiseling stubble fields in fall on the contour or across the slope reduces runoff and water erosion, conserves moisture, and promotes aeration. Chiseling also improves soil tilth because it produces hard clods that are gradually broken down by successive freezing and thawing.

Rangeland.—The potential native plant community is mainly western wheatgrass, green needlegrass, thickspike wheatgrass, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, blue grama, Sandberg bluegrass, and big sagebrush increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,200 pounds per acre of air-dry vegetation in years of above-normal precipitation and 500 pounds in years of below-normal precipitation.

Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Areas of deteriorated rangeland can be improved by mechanical treatment practices such as shallow chiseling and scalping. Control of big sagebrush to reduce its competition with desirable forage plants is a suitable practice.

Windbreaks.—This soil is poorly suited to windbreaks. It is salt- and sodium-affected, which limits the choice of trees and shrubs to Russian-olive and silver buffaloberry.

Homesite development.—This soil is poorly suited to homesite development. It is limited mainly by slow permeability, shrink-swell potential, and low soil strength. In the construction of basements or foundations for dwellings, the limitation of shrink-swell potential can be overcome by backfilling with suitable material that has low shrink-swell potential. If this soil is used for septic tank absorption fields, the limitation of slow permeability can be overcome by increasing the size of the absorption field or by excavating the trench to a suitable depth. The field or trench should be backfilled with gravel. Shrinking and swelling and low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill

material that is properly compacted can overcome these limitations.

This map unit is in capability subclass IVs, nonirrigated. It is in Clay Pan range site, 10- to 14-inch precipitation zone.

121—Rominell loam, gullied, 0 to 8 percent slopes. This deep, well drained, salt- and sodium-affected soil is on fans and terraces in the west-central and northern parts of the county. It is commonly dissected by gullies that are caused by the concentrated flow of water from adjacent higher-lying areas. They are 2 to 10 feet deep, as much as 5 feet wide, and 100 to 500 feet apart. The soil formed in alluvium derived from sandstone and shale. Slopes are mainly 250 to 1,000 feet long. Elevation is 1,900 to 2,600 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Kremlin, Benz, and Yawdim soils and Chinook soils, gullied. These areas do not adversely affect the use and management of this unit as rangeland.

Typically, this Rominell soil has a surface layer of grayish brown loam 4 inches thick. The subsurface layer is light brownish gray fine sandy loam 5 inches thick. The upper 6 inches of the subsoil is light brownish gray clay loam, and the lower 10 inches is light olive brown loam. The substratum to a depth of 60 inches or more is mostly brown clay loam.

Permeability is slow, and available water capacity is moderate. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 24 inches. Runoff is slow to medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate. This soil is moderately salt-affected and strongly sodium-affected at a depth of about 9 inches.

This soil is used as rangeland.

Cropland.—This soil is poorly suited to cultivated crops because the many deep, narrow gullies make tillage difficult.

Rangeland.—The potential native plant community is mainly western wheatgrass, thickspike wheatgrass, green needlegrass, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, blue grama, Sandberg bluegrass, and big sagebrush increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,000 pounds per acre of air-dry vegetation in years of above-normal precipitation and 500 pounds in years of below-normal precipitation.

The surface layer is susceptible to water erosion and soil blowing if it is disturbed or the range is overgrazed. Proper grazing use insures good plant vigor and adequate plant cover. The many deep, narrow gullies make seeding and mechanical treatment difficult.

Windbreaks.—This soil is poorly suited to windbreaks. It is salt- and sodium-affected, which limits the choice of trees and shrubs to Russian-olive and silver buffaloberry.

Homesite development.—This soil is poorly suited to homesite development. It is limited mainly by slow permeability, shrink-swell potential, low soil strength, and the many gullies, which limit access. In the construction of basements or foundations for dwellings, the limitation of shrink-swell potential can be overcome by backfilling with suitable material that has low shrink-swell potential. If this soil is used for septic tank absorption fields, the limitation of slow permeability can be overcome by increasing the size of the absorption field or by excavating the trench to a suitable depth. The field or trench should be backfilled with gravel. Shrinking and swelling and low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations.

This map unit is in capability subclass VIe, nonirrigated. It is in Clay Pan range site, 10- to 14-inch precipitation zone.

122—Rominell-Yamac loams, 4 to 15 percent slopes. This map unit is on uplands in the west-central part of the county. Slopes are mainly less than 250 feet long. Elevation is 1,900 to 2,600 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

This unit is about 45 percent Rominell loam and 40 percent Yamac loam. The moderately sloping Rominell soil is on fans and in swales between low hills, and the moderately sloping to strongly sloping Yamac soil is on the sides and tops of hills.

Included in this unit are small areas of Kremlin, Fleak, and Yadim soils and Chinook soils, gullied. Included areas make up about 15 percent of the total acreage. The moderately sloping Chinook soils, gullied, are on fans. The deep, narrow gullies make tillage difficult. The shallow, well drained Fleak and Yawdim soils are on the tops of hills and ridges. They are droughty and are low in productivity. The Kremlin soils do not adversely affect the use and management of this unit as rangeland and for nonirrigated farming.

The Rominell soil is deep and well drained and is salt- and sodium-affected. It formed in alluvium. Typically, the surface layer is grayish brown loam 4 inches thick. The subsurface layer is light brownish gray fine sandy loam 5 inches thick. The upper 6 inches of the subsoil is light brownish gray clay loam, and the lower 10 inches is light olive brown loam. The substratum to a depth of 60 inches or more is mostly brown clay loam.

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

Where this soil is under native vegetation, the average annual wetting depth is about 24 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate. This soil is moderately salt-affected and strongly sodium-affected at a depth of about 9 inches.

The Yamac soil is deep and well drained. It formed in alluvium. Typically, the surface layer is grayish brown loam 4 inches thick. The upper 7 inches of the subsoil is olive loam, and the lower 8 inches is grayish brown loam. The substratum to a depth of 60 inches or more is pale olive loam.

Permeability is moderate, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 21 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate. This soil is calcareous throughout.

Most areas of these soils are used as rangeland. A few areas are used for nonirrigated farming. The main nonirrigated crops are wheat, oats, and barley.

Cropland.—These soils are suited to nonirrigated crops. They are limited mainly by the content of salts and sodium in the subsoil of the Rominell soil and by the hazards of soil blowing and water erosion. The salts in the subsoil of the Rominell soil reduce the amount of moisture available for plant growth. Keeping tillage at a minimum not only maintains tilth of the surface layer but also increases water infiltration and reduces the risk of erosion. Chiseling stubble fields in fall on the contour or across the slope reduces runoff and water erosion, conserves moisture, and promotes aeration. Chiseling also improves soil tilth because it produces hard clods that are gradually broken down by successive freezing and thawing.

Rangeland.—The potential native plant community on the Rominell soil is mainly western wheatgrass, green needlegrass, thickspike wheatgrass, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, blue grama, Sandberg bluegrass, and big sagebrush increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,200 pounds per acre of air-dry vegetation in years of above-normal precipitation and 500 pounds in years of below-normal precipitation.

The potential native plant community on the Yamac soil is mainly western wheatgrass, green needlegrass, little bluestem, bluebunch wheatgrass, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, perennial short grasses, threadleaf sedge, and fringed sagewort increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,600 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,000 pounds in years of below-normal precipitation.

The surface layer of these soils is susceptible to water erosion and soil blowing if it is disturbed or the range is overgrazed. Proper grazing use insures good plant vigor and adequate plant cover. Rangeland seeding of native plants or adapted introduced grasses and legumes is a suitable practice. Areas of deteriorated rangeland can be improved by mechanical treatment practices such as shallow chiseling and scalping. Conducting fieldwork on the contour or across the slope, where practical, reduces erosion and conserves moisture.

Windbreaks.—The Rominell soil is poorly suited to windbreaks. It is salt- and sodium-affected, which limits the choice of trees and shrubs to Russian-olive and silver buffaloberry.

The Yamac soil is suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian elm, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, and skunkbush sumac.

Homesite development.—These soils are poorly suited to homesite development. The Rominell soil is limited mainly by slow permeability, shrink-swell potential, and low soil strength. In the construction of basements or foundations for dwellings, the limitation of shrink-swell potential can be overcome by backfilling with suitable material that has low shrink-swell potential. If this soil is used for septic tank absorption fields, the limitation of slow permeability can be overcome by increasing the size of the absorption field or by excavating the trench to a suitable depth. The field or trench should be backfilled with gravel. Shrinking and swelling and low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations.

The Yamac soil is limited mainly by moderate permeability and low soil strength. If this soil is used for septic tank absorption fields, use of gravel backfill in the absorption line trench, excavated to a suitable depth, helps to compensate for the limitation of moderate permeability. Low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome this limitation.

This map unit is in capability subclass IVs, nonirrigated. The Rominell soil is in Clay Pan range site, 10- to 14-inch precipitation zone, and the Yamac soil is in Silty range site, 10- to 14-inch precipitation zone.

123—Savage silty clay loam, 0 to 4 percent slopes. This deep, well drained soil is on terraces and fans in the northeastern part of the county. It formed in alluvium. Slopes are mainly more than 1,000 feet long. Elevation is 1,900 to 3,400 feet. The average annual precipitation is about 14 inches, the average annual air temperature is

about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Farland, Farnuf, and Cherry soils. The Cherry soils are highly susceptible to soil blowing. The Farland and Farnuf soils do not adversely affect the use and management of this unit for nonirrigated farming or as rangeland.

Typically, this Savage soil has a surface layer of grayish brown silty clay loam 7 inches thick. The upper 9 inches of the subsoil is dark grayish brown silty clay loam, and the lower 20 inches is grayish brown silty clay loam. The upper 7 inches of the substratum is light brownish gray silty clay loam, and the lower part to a depth of 60 inches or more is mostly light brownish gray silty clay.

Permeability is moderately slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 30 inches. Runoff is slow to medium, and the hazard of water erosion is slight to moderate. The hazard of soil blowing is moderate.

Most areas of this soil are used for nonirrigated farming. A few areas are used as rangeland. The main nonirrigated crops are wheat, oats, and barley. If this soil is irrigated, it is prime farmland.

Cropland.—This soil is well suited to nonirrigated crops. It is limited mainly by the hazards of soil blowing and water erosion. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, stubble mulch tillage, and grassed waterways reduce soil blowing and water erosion.

Rangeland.—The potential native plant community is mainly western wheatgrass, green needlegrass, thickspike wheatgrass, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of Sandberg bluegrass, blue grama, big sagebrush, and perennial forbs increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 2,000 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,200 pounds in years of below-normal precipitation.

Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. The surface layer is susceptible to water erosion and soil blowing if it is disturbed or the range is overgrazed. Proper grazing use insures good plant vigor and adequate plant cover. Areas of deteriorated rangeland can be improved by mechanical treatment practices such as shallow chiseling and scalping.

Windbreaks.—This soil is well suited to windbreaks. Suitable trees for planting are Russian-olive, white willow, golden willow, Siberian elm, Siberian crabapple, black hawthorn, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and western sandcherry.

Homesite development.—This soil is poorly suited to homesite development. It is limited mainly by moderately slow permeability, shrink-swell potential, and low soil strength. If buildings are constructed on this soil, properly designing foundations and footings and diverting runoff away from buildings help to prevent structural damage as a result of shrinking and swelling. If the soil is used for septic tank absorption fields, the limitation of moderately slow permeability can be overcome by increasing the size of the absorption field or by excavating the trench to a suitable depth. The field or trench should be backfilled with gravel. Shrinking and swelling and low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations.

This map unit is in capability subclass IIIe, nonirrigated. It is in Clayey range site, 10- to 14-inch precipitation zone.

124—Shambo loam, 0 to 4 percent slopes. This deep, well drained soil is on terraces and fans in the eastern part of the county. It formed in alluvium. Slopes are mainly more than 1,000 feet long. Elevation is 1,900 to 3,400 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Macar, Tally, Cambert, and Bryant soils. The Tally soils are highly susceptible to soil blowing. The Cambert soils are moderately deep to weakly consolidated, silty sedimentary beds that limit rooting depth. The Macar and Bryant soils do not adversely affect the use and management of this unit as rangeland and for nonirrigated crops.

Typically, this Shambo soil has a surface layer of grayish brown loam 4 inches thick. The upper 10 inches of the subsoil is brown loam, and the lower 8 inches is pale yellow loam. The substratum to a depth of 60 inches or more is light gray loam.

Permeability is moderate, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 30 inches. Runoff is slow to medium, and the hazard of water erosion is slight to moderate. The hazard of soil blowing is moderate. This soil is calcareous below a depth of about 14 inches.

This soil is used as rangeland and for nonirrigated crops. The main nonirrigated crops are wheat, oats, and barley.

Cropland.—This soil is well suited to nonirrigated crops. It is limited mainly by the hazards of soil blowing and water erosion. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, stubble mulch tillage, and

grassed waterways reduce soil blowing and water erosion.

Rangeland.—The potential native plant community is mainly western wheatgrass, green needlegrass, little bluestem, bluebunch wheatgrass, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, blue grama, fringed sagewort, silver sagebrush, and perennial forbs increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,800 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,200 pounds in years of below-normal precipitation.

The surface layer is susceptible to water erosion and soil blowing if it is disturbed or the range is overgrazed. Proper grazing use insures good plant vigor and adequate plant cover. Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Areas of deteriorated rangeland can be improved by mechanical treatment practices such as shallow chiseling and scalping.

Windbreaks.—This soil is well suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian elm, white willow, golden willow, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, skunkbush sumac, and silver buffaloberry.

Homesite development.—This soil is suited to homesite development. It is limited mainly by moderate permeability, low soil strength, and potential for shrinking and swelling. If this soil is used for septic tank absorption fields, use of gravel backfill in the absorption line trench, excavated to a suitable depth, helps to compensate for the limitation of moderate permeability. Shrinking and swelling and low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations.

This map unit is in capability subclass IIIe, nonirrigated. It is in Silty range site, 10- to 14-inch precipitation zone.

125—Shambo loam, 4 to 8 percent slopes. This deep, well drained soil is on fans and foot slopes of low hills in the eastern part of the county. It formed in alluvium. Slopes are mainly 250 to 1,000 feet long. Elevation is 1,900 to 3,400 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Macar, Cambert, Tally, and Bryant soils. The Tally soils are highly susceptible to soil blowing. The Cambert soils are moderately deep to weakly consolidated sedimentary beds that limit rooting depth. The Macar and Bryant soils do not adversely affect the use and management of this unit as rangeland and for nonirrigated crops.

Typically, this Shambo soil has a surface layer of grayish brown loam 4 inches thick. The upper 10 inches of the subsoil is brown loam, and the lower 8 inches is pale yellow loam. The substratum to a depth of 60 inches or more is light gray loam.

Permeability is moderate, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 30 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate. This soil is calcareous below a depth of about 14 inches.

Most areas of this soil are used for nonirrigated farming. A few areas are used as rangeland. The main nonirrigated crops are wheat, oats, and barley.

Cropland.—This soil is well suited to nonirrigated crops. It is limited mainly by the hazards of soil blowing and water erosion. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, stubble mulch tillage, and grassed waterways reduce soil blowing and water erosion.

Rangeland.—The potential native plant community is mainly western wheatgrass, green needlegrass, little bluestem, bluebunch wheatgrass, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, blue grama, fringed sagewort, silver sagebrush, and perennial forbs increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,800 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,200 pounds in years of below-normal precipitation.

The surface layer is susceptible to water erosion and soil blowing if it is disturbed or the range is overgrazed. Proper grazing use insures good plant vigor and adequate plant cover. Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Areas of deteriorated rangeland can be improved by mechanical treatment practices such as shallow chiseling and scalping.

Windbreaks.—This soil is well suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian elm, white willow, golden willow, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, skunkbush sumac, and silver buffaloberry.

Homesite development.—This soil is suited to homesite development. It is limited mainly by moderate permeability, low soil strength, and potential for shrinking and swelling. If this soil is used for septic tank absorption fields, use of gravel backfill in the absorption line trench, excavated to a suitable depth, helps to compensate for the limitation of moderate permeability. Shrinking and swelling and low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate

drainage and the use of suitable fill material that is properly compacted can overcome these limitations.

This map unit is in capability subclass IIIe, nonirrigated. It is in Silty range site, 10- to 14-inch precipitation zone.

126—Shambo-Cabba loams, 8 to 15 percent slopes. This map unit is on uplands in the east-central and southeastern parts of the county. Slopes are mainly 250 to 1,000 feet long. Elevation is 1,900 to 3,400 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

This unit is about 50 percent Shambo loam and 35 percent Cabba loam. The Shambo soil is on fans and foot slopes, and the Cabba soil is on the side slopes and tops of hills and ridges.

Included in this unit are small areas of Macar, Cambert, Tally, and Bryant soils. Included soils make up about 15 percent of the total acreage. The Macar and Tally soils are on fans and foot slopes. The Tally soils are highly susceptible to soil blowing. The Cambert soils are on hillsides. They are moderately deep to root-limiting, weakly consolidated sedimentary beds. The Macar and Bryant soils do not adversely affect the use and management of this unit as rangeland and for nonirrigated farming.

The Shambo soil is deep and well drained. It formed in alluvium. Typically, the surface layer is grayish brown loam 4 inches thick. The upper 10 inches of the subsoil is brown loam, and the lower 8 inches is pale yellow loam. The substratum to a depth of 60 inches or more is light gray loam.

Permeability is moderate, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 27 inches. Runoff is medium, and the hazard of water erosion is high. The hazard of soil blowing is moderate. This soil is calcareous below a depth of about 14 inches.

The Cabba soil is shallow and well drained. It formed in material derived from weakly consolidated, sandy and silty sedimentary beds. Typically, the surface layer is light yellowish brown loam 5 inches thick. The underlying material to a depth of 15 inches is light yellowish brown and pale yellow loam. Below this to a depth of 60 inches or more are pale yellow, weakly consolidated, sandy and silty sedimentary beds. Sedimentary beds are at a depth of 10 to 20 inches.

Permeability is moderate, and available water capacity is very low. Effective rooting depth is limited by the sedimentary beds at a depth of 10 to 20 inches. Where this soil is under native vegetation, the average annual wetting depth is 10 to 20 inches. Runoff is medium, and the hazard of water erosion is high. The hazard of soil blowing is high. This soil is calcareous throughout. It is droughty.

These soils are used as rangeland and for nonirrigated farming. The main nonirrigated crops are wheat, oats, and barley.

Cropland.—These soils are suited to nonirrigated crops. They are limited mainly by the hazards of soil blowing and water erosion. The Cabba soil is also limited by droughtiness and the shallow depth to root-limiting sedimentary beds. Minimum tillage, contour cultivation, stripcropping, tall grass barriers, grassed waterways, and return of crop residue to the soil reduce soil blowing and water erosion. Tall grass barriers also reduce evaporation and trap snow, which increases the amount of moisture in the soil. Return of crop residue also helps to maintain good soil tilth. Chiseling stubble fields in fall on the contour or across the slope reduces runoff and water erosion. Subsoiling the Cabba soil increases its effective rooting depth.

Rangeland.—The potential native plant community on the Shambo soil is mainly western wheatgrass, green needlegrass, little bluestem, bluebunch wheatgrass, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, blue grama, fringed sagewort, silver sagebrush, and perennial forbs increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,600 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,000 pounds in years of below-normal precipitation.

The potential native plant community on the Cabba soil is mainly bluebunch wheatgrass, western wheatgrass, little bluestem, plains muhly, and needleandthread. If the range is excessively grazed, the proportion of bluebunch wheatgrass, western wheatgrass, little bluestem, and plains muhly decreases and the proportion of needleandthread, perennial short grasses, threadleaf sedge, and perennial forbs increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,200 pounds per acre of air-dry vegetation in years of above-normal precipitation and 700 pounds in years of below-normal precipitation.

The surface layer of these soils is susceptible to water erosion and soil blowing if it is disturbed or the range is overgrazed. Proper grazing use insures good plant vigor and adequate plant cover. Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Areas of deteriorated rangeland can be improved by mechanical treatment practices such as shallow chiseling and scalping. Subsoiling the Cabba soil would improve its ability to respond to management. Conducting fieldwork on the contour or across the slope, where practical, reduces erosion and conserves moisture.

Windbreaks.—The Shambo soil is well suited to windbreaks. Suitable trees for planting are Russian-olive,

Siberian elm, white willow, golden willow, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, skunkbush sumac, and silver buffaloberry.

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

Homesite development.—These soils are poorly suited to homesite development. The Shambo soil is limited mainly by moderate permeability, low soil strength, and shrink-swell potential. If this soil is used for septic tank absorption fields, use of gravel backfill in the absorption line trench, excavated to a suitable depth, helps to compensate for the limitation of moderate permeability. Slope is a concern in installing septic tank absorption fields. Absorption lines should be installed on the contour. Shrinking and swelling and low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations.

The Cabba soil is limited for use as homesites mainly by low soil strength and slow permeability of the sedimentary beds. This soil is poorly suited to septic tank absorption fields because of the slow permeability of the sedimentary beds. Deep cuts needed to provide nearly level road surfaces can expose soft sedimentary beds that can easily be excavated. Low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome this limitation. In places, excavation for roads can expose material that is highly susceptible to soil blowing.

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

127—Shambo-Cambert loams, 2 to 8 percent slopes. This map unit is on uplands in the eastern part of the county. Slopes are mainly 250 feet to 1,000 feet long. Elevation is 1,900 to 3,400 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

This unit is about 50 percent Shambo loam and 40 percent Cambert loam. The Shambo soil is on fans and foot slopes, and the Cambert soil is on the side slopes and tops of low hills.

Included in this unit are small areas of Dast, Barkof, Cabba, and Bryant soils. Included soils make up about 10 percent of the total acreage. The Dast, Barkof, and Cabba soils are on the side slopes and tops of low hills. The Dast soils are highly susceptible to soil blowing and are moderately deep to weakly consolidated, sandy sedimentary beds. The Barkof soils are moderately deep to semiconsolidated shale. The Cabba soils are highly susceptible to soil blowing and are shallow to weakly consolidated, sandy and silty sedimentary beds. All of these soils have limited rooting depth. The Bryant soils do not adversely affect the use and management of this unit as rangeland and for nonirrigated crops.

The Shambo soil is deep and well drained. It formed in alluvium. Typically, the surface layer is grayish brown loam 4 inches thick. The upper 10 inches of the subsoil is brown loam, and the lower 8 inches is pale yellow loam. The substratum to a depth of 60 inches or more is light gray loam.

Permeability is moderate, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 30 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate. This soil is calcareous below a depth of about 14 inches.

The Cambert soil is moderately deep and well drained. It formed in material derived from weakly consolidated, silty sedimentary beds. Typically, the surface layer is brown loam 4 inches thick. The subsoil is mostly brown loam 9 inches thick. The substratum to a depth of 26 inches is very pale brown silty clay loam. Below this to a depth of 60 inches or more are pale yellow and light gray, weakly consolidated, silty sedimentary beds. Sedimentary beds are at a depth of 20 to 40 inches.

Permeability is moderate, and available water capacity is moderate. Effective rooting depth is limited by the sedimentary beds at a depth of 20 to 40 inches. Where this soil is under native vegetation, the average annual wetting depth is 20 to 30 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate. This soil is calcareous below a depth of 9 inches.

These soils are used as rangeland and for nonirrigated crops. The main nonirrigated crops are wheat, oats, and barley.

Cropland.—These soils are suited to nonirrigated crops. They are limited mainly by the hazards of soil blowing and water erosion and by the moderate depth to sedimentary beds in the Cambert soil. These beds limit rooting depth. Minimum tillage, contour cultivation, stripcropping, tall grass barriers, grassed waterways, and return of crop residue to the soil reduce soil blowing and water erosion. Tall grass barriers also reduce evaporation and trap snow, which increases the amount of moisture in the soil. Return of crop residue also helps to maintain good soil tilth. Chiseling stubble fields in fall on the contour or across the slope reduces runoff and water erosion.

Rangeland.—The potential native plant community on these soils is mainly western wheatgrass, green needlegrass, little bluestem, bluebunch wheatgrass, and

winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, blue grama, fringed sagewort, silver sagebrush, and perennial forbs increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community on the Shambo soil produces about 1,800 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,200 pounds in years of below-normal precipitation. The potential native plant community on the Cambert soil produces about 1,600 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,000 pounds in years of below-normal precipitation.

The surface layer of these soils is susceptible to water erosion and soil blowing if it is disturbed or the range is overgrazed. Proper grazing use insures good plant vigor and adequate plant cover. Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Areas of deteriorated rangeland can be improved by mechanical treatment practices such as shallow chiseling and scalping. Conducting fieldwork on the contour or across the slope, where practical, reduces erosion and conserves moisture.

Windbreaks.—The Shambo soil is well suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian elm, white willow, golden willow, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, skunkbush sumac, and silver buffaloberry.

The Cambert soil is suited to windbreaks, but the limited moisture supply restricts the choice of trees and shrubs. Suitable trees for planting are Russian-olive, Siberian elm, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, and skunkbush sumac.

Homesite development.—These soils are poorly suited to homesite development. The Shambo soil is limited mainly by moderate permeability, low soil strength, and potential for shrinking and swelling. If this soil is used for septic tank absorption fields, use of gravel backfill in the absorption line trench, excavated to a suitable depth, helps to compensate for the limitation of moderate permeability. Shrinking and swelling and low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations.

The Cambert soil is limited for use as homesites mainly by low soil strength and slow permeability of the underlying sedimentary beds. This soil is poorly suited to septic tank absorption fields because of the slow permeability of the sedimentary beds. Low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome this limitation. In places, excavation for roads can expose material that is highly susceptible to soil blowing.

This map unit is in capability subclass IIIe, nonirrigated. It is in Silty range site, 10- to 14-inch precipitation zone.

128—Sunburst clay loam, 2 to 8 percent slopes. This deep, well drained soil is on knolls and foot slopes of low hills in the northwestern part of the county. It formed in glacial till. Slopes are mainly 250 to 1,000 feet long. Elevation is 2,000 to 2,500 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Telstad, Yamac, Busby, and Thoeny soils. The Thoeny soils are in shallow depressional areas on fans and foot slopes. They have a moderately sodium-affected subsoil, which reduces the penetration of roots and moisture. This characteristic limits crop yields. The Telstad, Yamac, and Busby soils do not adversely affect the use and management of this unit as rangeland and for nonirrigated farming.

Typically, this Sunburst soil has a surface layer of grayish brown clay loam 3 inches thick. The upper 16 inches of the underlying material is grayish brown silty clay loam, and the lower part to a depth of 60 inches or more is mostly grayish brown silty clay.

Permeability is slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 24 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high. This soil is calcareous throughout.

Most areas of this soil are used as rangeland. A few areas are used for nonirrigated farming. The main nonirrigated crops are wheat, oats, and barley.

Cropland.—This soil is well suited to nonirrigated crops. It is limited mainly by the high hazard of soil blowing and the moderate hazard of water erosion. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, stubble mulch tillage, and grassed waterways reduce soil blowing and water erosion. The surface layer of this soil is high in content of lime and low in content of organic matter. Using green manure crops, barnyard manure, and crop residue increases the organic matter content and fertility of the soil. Crops respond well to the application of phosphorus and nitrogen.

Rangeland.—The potential native plant community is mainly western wheatgrass, green needlegrass, thickspike wheatgrass, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of Sandberg bluegrass, blue grama, big sagebrush, and perennial forbs increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 2,000 pounds

per acre of air-dry vegetation in years of above-normal precipitation and 1,200 pounds in years of below-normal precipitation.

The surface layer is susceptible to water erosion and soil blowing if it is disturbed or the range is overgrazed. Proper grazing use insures good plant vigor and adequate plant cover. Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Areas of deteriorated rangeland can be improved by mechanical treatment practices such as shallow chiseling and scalping.

Windbreaks.—This soil is suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian elm, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, and skunkbush sumac.

Homesite development.—This soil is poorly suited to homesite development. It is limited mainly by slow permeability, shrink-swell potential, and low soil strength. Buildings can be designed to offset the effects of shrinking and swelling. If this soil is used for septic tank absorption fields, use of gravel backfill in the absorption line trench, excavated to a suitable depth, helps to compensate for the limitation of slow permeability. Shrinking and swelling and low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. In places, excavation for roads can expose material that is highly susceptible to soil blowing.

This map unit is in capability subclass IIIe, nonirrigated. It is in Clayey range site, 10- to 14-inch precipitation zone.

129—Sunburst clay loam, 8 to 15 percent slopes. This deep, well drained soil is on the sides and tops of hills and ridges in the northwestern part of the county. It formed in glacial till. Slopes are mainly 250 to 1,000 feet long. Elevation is 2,000 to 2,500 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Telstad, Yamac, Busby, and Thoeny soils. The Thoeny soils are in shallow depressional areas on fans and foot slopes. They have a moderately sodium-affected subsoil, which reduces penetration by roots and moisture. This characteristic limits crop yields. The Telstad, Yamac, and Busby soils do not adversely affect the use and management of this unit as rangeland and for nonirrigated farming.

Typically, this Sunburst soil has a surface layer of grayish brown clay loam 3 inches thick. The upper 16 inches of the underlying material is grayish brown silty clay loam, and the lower part to a depth of 60 inches or more is mostly grayish brown silty clay.

Permeability is slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 20 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is high. The soil is calcareous throughout.

Most areas of this soil are used as rangeland. A few areas are used for nonirrigated farming. The main nonirrigated crops are wheat, oats, and barley.

Cropland.—This soil is suited to nonirrigated crops. It is limited mainly by the hazards of soil blowing and water erosion. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, stubble mulch tillage, and grassed waterways reduce soil blowing and water erosion. The surface layer of this soil is high in content of lime and low in content of organic matter. Using green manure crops, barnyard manure, and crop residue increases the organic matter content and fertility of the soil. Crops respond well to the application of phosphorus and nitrogen.

Rangeland.—The potential native plant community is mainly western wheatgrass, green needlegrass, thickspike wheatgrass, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of Sandberg bluegrass, blue grama, big sagebrush, and perennial forbs increases. If excessive grazing continues, plants such as annuals, weedlike forbs, and clubmoss may invade. The potential native plant community produces about 1,800 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,000 pounds in years of below-normal precipitation.

The surface layer is susceptible to water erosion and soil blowing if it is disturbed or the range is overgrazed. Proper grazing use insures good plant vigor and adequate plant cover. Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Areas of deteriorated rangeland can be improved by mechanical treatment practices such as shallow chiseling, scalping, and contour furrowing. All tillage should be on the contour or across the slope.

Windbreaks.—This soil is suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian elm, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, and skunkbush sumac.

Homesite development.—This soil is poorly suited to homesite development. It is limited mainly by slow permeability, shrink-swell potential, and low soil strength. Buildings can be designed to offset the effects of shrinking and swelling. If this soil is used for septic tank absorption fields, use of gravel backfill in the absorption line trench, excavated to a suitable depth, helps to compensate for the limitation of slow permeability. Slope is a concern in installing septic tank absorption fields. Absorption lines should be installed on the contour. Shrinking and swelling and low soil strength can

adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. Access roads must be designed to provide adequate cut-slope grade, and drains must be used to control surface runoff and keep soil losses to a minimum.

This map unit is in capability subclass IVe, nonirrigated. It is in Clayey range site, 10- to 14-inch precipitation zone.

130—Sunburst clay loam, 15 to 45 percent slopes. This deep, well drained soil is on the sides and tops of ridges and hills in the northwestern part of the county. It formed in glacial till. Slopes are mainly less than 250 feet long. Elevation is 2,000 to 2,500 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Fleak, Bascovy, and Busby soils and areas of sandstone and shale outcroppings. The areas of soil do not adversely affect the use and management of this unit as rangeland. The areas of sandstone and shale outcroppings limit the range production of the unit.

Typically, this Sunburst soil has a surface layer of grayish brown clay loam 3 inches thick. The upper 16 inches of the underlying material is grayish brown silty clay loam, and the lower part to a depth of 60 inches or more is grayish brown and dark grayish brown silty clay.

Permeability is slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 16 inches. Runoff is rapid, and the hazard of water erosion is very high. The hazard of soil blowing is high. The soil is calcareous throughout.

This soil is used as rangeland.

Cropland.—This soil is very poorly suited to cultivated crops because of the steepness of slope.

Rangeland.—The potential native plant community is mainly little bluestem, bluebunch wheatgrass, green needlegrass, and sideoats grama. If the range is excessively grazed, the proportion of these grasses decreases and the proportion of perennial short grasses, threadleaf sedge, perennial forbs, and creeping juniper increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,400 pounds per acre of air-dry vegetation in years of above-normal precipitation and 850 pounds in years of below-normal precipitation.

Steepness of slope limits access by livestock and promotes overgrazing of the less sloping areas of this soil. The soil has potential to produce good yields of forage, but the steepness of slope limits the movement of livestock and the accessibility of forage. Use of mechanical treatment practices or rangeland seeding is very difficult because of the steepness of slope.

Windbreaks.—This soil is not suited to windbreaks. It is limited mainly by steepness of slope.

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

This map unit is in capability subclass VIe, nonirrigated. It is in Thin Clayey range site, 10- to 14-inch precipitation zone.

131—Tally fine sandy loam, 0 to 4 percent slopes. This deep, well drained soil is on fans, terraces, and foot slopes in the eastern part of the county. It formed in alluvial and eolian material. Slopes are mainly 250 to 1,000 feet long. Elevation is 1,900 to 3,400 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Shambo, Lisk, Farnuf, and Macar soils. These areas do not adversely affect the use and management of this unit for nonirrigated farming and as rangeland.

Typically, this Tally soil has a surface layer of dark grayish brown fine sandy loam 4 inches thick. The upper 11 inches of the subsoil is dark grayish brown and grayish brown sandy loam, and the lower 5 inches is light brownish gray sandy loam. The upper 11 inches of the substratum is light gray fine sandy loam, and the lower part to a depth of 60 inches or more is light brownish gray loamy fine sand.

Permeability is moderately rapid to a depth of about 31 inches and rapid below this depth. Available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 36 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high.

This soil is used for nonirrigated farming and as rangeland. The main nonirrigated crops are wheat, oats, and barley.

Cropland.—This soil is suited to nonirrigated crops. It is limited mainly by the high hazard of soil blowing. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, and stubble mulch tillage reduce soil blowing.

Rangeland.—The potential native plant community is mainly prairie sandreed, little bluestem, big bluestem, and needleandthread. If the range is excessively grazed, the proportion of prairie sandreed, little bluestem, and big bluestem decreases and the proportion of needleandthread, perennial short grasses, threadleaf sedge, perennial forbs, and yucca increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,800 pounds per acre of air-dry

vegetation in years of above-normal precipitation and 1,200 pounds in years of below-normal precipitation.

The surface layer is susceptible to water erosion and soil blowing if it is disturbed or the range is overgrazed. Proper grazing use insures good plant vigor and adequate plant cover. Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Areas of deteriorated rangeland can be improved by mechanical treatment practices such as shallow chiseling and scalping.

Windbreaks.—This soil is well suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian elm, white willow, golden willow, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, skunkbush sumac, and silver buffaloberry.

Homesite development.—This soil is well suited to homesite development. It has few limitations. In places, excavation for roads can expose material that is highly susceptible to soil blowing.

This map unit is in capability subclass IIIe, nonirrigated. It is in Sandy range site, 10- to 14-inch precipitation zone.

132—Tally fine sandy loam, 4 to 8 percent slopes. This deep, well drained soil is on fans and foot slopes of low hills in the eastern part of the county. It formed in alluvium and eolian material. Slopes are mainly less than 1,000 feet long. Elevation is 1,900 to 3,400 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Shambo, Blanchard, Lisk, Farnuf, and Macar soils. The deep, excessively drained Blanchard soils are in swales, on foot slopes, and in areas protected from the prevailing wind. They are droughty and are low in productivity. The Shambo, Lisk, Farnuf, and Macar soils do not adversely affect the use and management of this unit as rangeland and for nonirrigated farming.

Typically, this Tally soil has a surface layer of dark grayish brown fine sandy loam 4 inches thick. The upper 11 inches of the subsoil is dark grayish brown and grayish brown sandy loam, and the lower 5 inches is light brownish gray sandy loam. The upper 11 inches of the substratum is light gray fine sandy loam, and the lower part to a depth of 60 inches or more is light brownish gray loamy fine sand.

Permeability is moderately rapid to a depth of about 31 inches and rapid below this depth. Available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 36 inches. Runoff is slow, and the hazard of water erosion is moderate. The hazard of soil blowing is high.

This soil is used as rangeland and for nonirrigated farming. The main nonirrigated crops are wheat, oats, and barley.

Cropland.—This soil is suited to nonirrigated crops. It is limited mainly by the hazards of soil blowing and water erosion. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, stubble mulch tillage, and grassed waterways reduce soil blowing and water erosion.

Rangeland.—The potential native plant community is mainly prairie sandreed, little bluestem, big bluestem, and needleandthread. If the range is excessively grazed, the proportion of prairie sandreed, little bluestem, and big bluestem decreases and the proportion of needleandthread, perennial short grasses, threadleaf sedge, perennial forbs, and yucca increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,800 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,200 pounds in years of below-normal precipitation.

The surface layer is susceptible to water erosion and soil blowing if it is disturbed or the range is overgrazed. Proper grazing use insures good plant vigor and adequate plant cover. Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Areas of deteriorated rangeland can be improved by mechanical treatment practices such as shallow chiseling and scalping.

Windbreaks.—This soil is well suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian elm, white willow, golden willow, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, skunkbush sumac, and silver buffaloberry.

Homesite development.—This soil is well suited to homesite development. It has few limitations. In places, excavation for roads can expose material that is highly susceptible to soil blowing.

This map unit is in capability subclass IVe, nonirrigated. It is in Sandy range site, 10- to 14-inch precipitation zone.

133—Telstad loam, 2 to 8 percent slopes. This deep, well drained soil is in swales and on fans and foot slopes in the northwestern part of the county. It formed in glacial till. Slopes are mainly less than 1,000 feet long. Elevation is 2,000 to 2,500 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Hillon, Evanston, Yamac, and Thoeny soils. The Hillon soils are in convex areas. They are highly susceptible to soil blowing. The salt- and sodium-affected Thoeny soils are on fans and foot slopes. The salts and sodium reduce the availability of moisture and plant nutrients and restrict

the penetration of roots and moisture into the subsoil and thus limit crop yields. The Evanston and Yamac soils do not adversely affect the use and management of this unit as rangeland and for nonirrigated farming.

Typically, this Telstad soil has a surface layer of dark grayish brown loam 4 inches thick. The upper 9 inches of the subsoil is dark grayish brown and grayish brown clay loam, and the lower 9 inches is light gray loam. The substratum to a depth of 60 inches or more is light brownish gray loam.

Permeability is slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 24 inches. Runoff is slow to medium, and the hazard of water erosion is slight to moderate. The hazard of soil blowing is moderate. The soil is calcareous below a depth of about 13 inches.

This soil is used as rangeland and for nonirrigated farming. The main nonirrigated crops are wheat, oats, and barley.

Cropland.—This soil is well suited to nonirrigated crops. It is limited mainly by the moderate hazards of water erosion and soil blowing. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, stubble mulch tillage, and grassed waterways reduce soil blowing and water erosion.

Rangeland.—The potential native plant community is mainly western wheatgrass, green needlegrass, little bluestem, bluebunch wheatgrass, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, perennial short grasses, threadleaf sedge, fringed sagewort, silver sagebrush, and perennial forbs increases. If excessive grazing continues, plants such as annuals, weedlike forbs, and clubmoss may invade. The potential native plant community produces about 1,800 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,200 pounds in years of below-normal precipitation.

The surface layer is susceptible to water erosion and soil blowing if it is disturbed or the range is overgrazed. Proper grazing use insures good plant vigor and adequate plant cover. Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Where clubmoss or blue grama is the dominant vegetation, practices such as shallow chiseling and scalping can be used to improve the rangeland. Such practices increase water infiltration, reduce plant competition, and allow the more desirable native plants to increase.

Windbreaks.—This soil is well suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian elm, white willow, golden willow, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, skunkbush sumac, and silver buffaloberry.

Homesite development.—This soil is poorly suited to homesite development. It is limited mainly by slow permeability, low soil strength, and shrink-swell potential. Buildings can be designed to offset the effects of shrinking and swelling. If this soil is used for septic tank absorption fields, use of gravel backfill in the absorption line trench, excavated to a suitable depth, helps to compensate for the limitation of slow permeability. Shrinking and swelling and low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations.

This map unit is in capability subclass IIIe, nonirrigated. It is in Silty range site, 10- to 14-inch precipitation zone.

134—Telstad-Hillon loams, 2 to 8 percent slopes. This map unit is on uplands in the northwestern part of the county. Slopes are mainly less than 1,000 feet long. Elevation is 2,000 to 2,500 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

This unit is about 50 percent Telstad loam and 35 percent Hillon loam. The Telstad soil is in swales and on foot slopes, and the Hillon soil is on the sides and tops of knolls and low hills.

Included in this unit are small areas of Thoeny and Evanston soils. Included areas make up about 15 percent of the total acreage. The salt- and sodium-affected Thoeny soils are in swales and on foot slopes. The salts and sodium reduce the availability of moisture and plant nutrients and restrict the penetration of roots and moisture into the subsoil and thus limit crop yields. The Evanston soils do not adversely affect the use and management of this unit as rangeland and for nonirrigated farming.

The Telstad soil is deep and well drained. It formed in glacial till. Typically, the surface layer is dark grayish brown loam 4 inches thick. The upper 9 inches of the subsoil is dark grayish brown to grayish brown clay loam, and the lower 9 inches is light gray loam. The substratum to a depth of 60 inches or more is light brownish gray loam.

Permeability is slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 24 inches. Runoff is slow to medium, and the hazard of water erosion is slight to moderate. The hazard of soil blowing is moderate. This soil is calcareous below a depth of about 13 inches.

The Hillon soil is deep and well drained. It formed in glacial till. Typically, the surface layer is mostly grayish brown loam 7 inches thick. The underlying material to a depth of 60 inches or more is light gray and pale yellow loam.

Permeability is slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 24 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high. This soil is calcareous throughout.

These soils are used as rangeland and for nonirrigated farming. The main nonirrigated crops are wheat, oats, and barley.

Cropland.—These soils are well suited to nonirrigated crops. They are limited mainly by the hazards of soil blowing and water erosion. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, stubble mulch tillage, and grassed waterways reduce soil blowing and water erosion. Tall grass barriers trap snow, which increases the amount of moisture in the soil.

Rangeland.—The potential native plant community is mainly western wheatgrass, green needlegrass, little bluestem, bluebunch wheatgrass, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, perennial short grasses, threadleaf sedge, fringed sagewort, and perennial forbs increases. If excessive grazing continues, plants such as annuals, weedlike forbs, and clubmoss may invade. The potential native plant community produces about 1,800 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,200 pounds in years of below-normal precipitation.

The surface layer of these soils is susceptible to water erosion and soil blowing if it is disturbed or the range is overgrazed. Proper grazing use insures good plant vigor and adequate plant cover. Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Where clubmoss and blue grama are the dominant vegetation, practices such as scalping or shallow chiseling can be used to improve the rangeland. Such practices increase water infiltration, reduce plant competition, and allow the more desirable native plants to increase.

Windbreaks.—The Telstad soil is well suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian elm, white willow, golden willow, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, skunkbush sumac, and silver buffaloberry.

The Hillon soil is suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian elm, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, and skunkbush sumac.

Homesite development.—These soils are poorly suited to homesite development. They are limited mainly by slow permeability, low soil strength, and shrink-swell potential. Buildings can be designed to offset the effects of shrinking and swelling. If these soils are used for septic tank absorption fields, use of gravel backfill in the absorption line trench, excavated to a suitable depth, helps to compensate for the limitation of slow permeability. Shrinking and swelling and low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations.

This map unit is in capability subclass IIIe, nonirrigated. It is in Silty range site, 10- to 14-inch precipitation zone.

135—Telstad-Hillon loams, 8 to 15 percent slopes. This map unit is on uplands in the northwestern part of the county. Slopes are mainly less than 250 feet long. Elevation is 2,000 to 2,500 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

This unit is about 40 percent Telstad loam and 40 percent Hillon loam. The Telstad soil is on fans and hillsides, and the Hillon soil is on the sides and tops of hills and ridges.

Included in this unit are small areas of Yawdim, Yamac, and Thoeny soils. Included areas make up about 20 percent of the total acreage. The shallow, well drained Yawdim soils are on the upper side slopes and tops of hills and ridges. They are droughty and are low in productivity. The salt- and sodium-affected Thoeny soils are in swales and on fans. The salts and sodium reduce the availability of moisture and plant nutrients and restrict the penetration of roots and moisture into the subsoil and thus limit crop yields. The Yamac soils do not adversely affect the use and management of this unit as rangeland and for nonirrigated farming.

The Telstad soil is deep and well drained. It formed in glacial till. Typically, the surface layer is dark grayish brown loam 4 inches thick. The upper 9 inches of the subsoil is mostly grayish brown clay loam, and the lower 9 inches is light gray loam. The substratum to a depth of 60 inches or more is light brownish gray loam.

Permeability is slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 21 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate. This soil is calcareous below a depth of about 13 inches.

The Hillon soil is deep and well drained. It formed in glacial till. Typically, the surface layer is mostly grayish brown loam 7 inches thick. The underlying material to a depth of 60 inches or more is mostly light gray loam.

Permeability is slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 21 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high. This soil is calcareous throughout.

These soils are used as rangeland and for nonirrigated farming. The main nonirrigated crops are wheat, oats, and barley.

Cropland.—These soils are suited to nonirrigated crops. They are limited mainly by the hazards of soil blowing and water erosion. Minimum tillage, contour cultivation, stripcropping, tall grass barriers, grassed waterways, and return of crop residue to the soil reduce soil blowing and water erosion. Tall grass barriers also reduce evaporation and trap snow, which increases the amount of moisture in the soil. Return of crop residue also helps to maintain good soil tilth. Chiseling stubble fields in fall on the contour or across the slope reduces runoff and water erosion.

Rangeland.—The potential native plant community on these soils is mainly western wheatgrass, green needlegrass, little bluestem, bluebunch wheatgrass, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, perennial short grasses, threadleaf sedge, fringed sagewort, and perennial forbs increases. If excessive grazing continues, plants such as annuals, weedlike forbs, and clubmoss may invade. The potential native plant community produces about 1,600 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,000 pounds in years of below-normal precipitation.

The surface layer of these soils is susceptible to water erosion and soil blowing if it is disturbed or the range is overgrazed. Proper grazing use insures good plant vigor and adequate plant cover. Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Where clubmoss and blue grama are the dominant vegetation, practices such as scalping or shallow chiseling can be used to improve the rangeland. Such practices increase water infiltration, reduce plant competition, and allow the more desirable native plants to increase. Conducting fieldwork on the contour or across the slope, where practical, reduces erosion and conserves moisture.

Windbreaks.—The Telstad soil is well suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian elm, white willow, golden willow, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, skunkbush sumac, and silver buffaloberry.

The Hillon soil is suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian elm, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, and skunkbush sumac.

Homesite development.—These soils are poorly suited to homesite development. They are limited mainly by slow permeability, low soil strength, and shrink-swell potential. Buildings can be designed to offset the effects of shrinking and swelling. If these soils are used for septic tank absorption fields, use of gravel backfill in the absorption line trench, excavated to a suitable depth, helps to compensate for the limitation of slow permeability. Slope is a concern in installing septic tank absorption fields. Absorption lines should be installed on the contour. Shrinking and swelling and low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. Access roads must be designed to provide adequate cut-slope grade, and drains must be used to control surface runoff and keep soil losses to a minimum.

This map unit is in capability subclass IVe, nonirrigated. It is in Silty range site, 10- to 14-inch precipitation zone.

136—Telstad-Thoeny loams, 2 to 8 percent slopes. This map unit is on fans and foot slopes and in swales on glaciated uplands in the northwestern part of the county. Slopes are mainly less than 1,000 feet long. Elevation is 2,000 to 2,500 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

This unit is about 50 percent Telstad loam and 30 percent Thoeny loam.

Included in this unit are small areas of Hillon, Yamac, and Yawdim soils. Included areas make up about 20 percent of the total acreage. The Hillon and Yamac soils are on fans and side slopes. The Hillon soils are highly susceptible to soil blowing. The shallow, well drained Yawdim soils are on the upper side slopes and tops of hills and ridges. They are droughty and are low in productivity. The Yamac soils do not adversely affect the use and management of this unit as rangeland and for nonirrigated farming.

The Telstad soil is deep and well drained. It formed in glacial till. Typically, the surface layer is dark grayish brown loam 4 inches thick. The upper 9 inches of the subsoil is mostly grayish brown clay loam, and the lower 9 inches is light gray loam. The substratum to a depth of 60 inches or more is light brownish gray loam.

Permeability is slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 24 inches. Runoff is slow to medium, and the hazard of water erosion is slight to moderate. The hazard of soil blowing is moderate. This soil is calcareous below a depth of about 13 inches.

The Thoeny soil is deep and well drained and is salt- and sodium-affected. It formed in glacial till. Typically, the surface layer is grayish brown loam 6 inches thick. The upper 6 inches of the subsoil is olive clay loam, and the lower 19 inches is grayish brown and olive gray clay. The substratum to a depth of 60 inches or more is grayish brown clay loam.

Permeability is very slow, and available water capacity is moderate. Effective rooting depth is 60 inches or

more. Where this soil is under native vegetation, the average annual wetting depth is about 24 inches. Runoff is slow to medium, and the hazard of water erosion is slight to moderate. The hazard of soil blowing is moderate. This soil is moderately salt- and sodium-affected at a depth of about 9 inches.

These soils are used mainly as rangeland. They are also used for nonirrigated farming. The main nonirrigated crops are wheat, oats, and barley.

Cropland.—These soils are poorly suited to nonirrigated crops. They are limited mainly by the hazards of soil blowing and water erosion and by the salt- and sodium-affected subsoil of the Thoeny soil. The salts and sodium in the Thoeny soil reduce the amount of moisture available for plant growth. Keeping tillage at a minimum not only helps to maintain the tilth of the surface layer but also increases water infiltration and reduces the risk of erosion. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, stubble mulch tillage, and grassed waterways reduce soil blowing and water erosion.

Rangeland.—The potential native plant community on the Telstad soil is mainly western wheatgrass, green needlegrass, little bluestem, bluebunch wheatgrass, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, perennial short grasses, threadleaf sedge, fringed sagewort, and perennial forbs increases. If excessive grazing continues, plants such as annuals, weedlike forbs, and clubmoss may invade. The potential native plant community produces about 1,600 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,000 pounds in years of below-normal precipitation.

The potential native plant community on the Thoeny soil is mainly western wheatgrass, green needlegrass, thickspike wheatgrass, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, blue grama, perennial forbs, and fringed sagewort increases. If excessive grazing continues, plants such as annuals, weedlike forbs, and clubmoss may invade. The potential native plant community produces about 1,200 pounds per acre of air-dry vegetation in years of above-normal precipitation and 500 pounds in years of below-normal precipitation.

The surface layer of these soils is susceptible to water erosion and soil blowing if it is disturbed or the range is overgrazed. Proper grazing use insures good plant vigor and adequate plant cover. Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Where clubmoss and blue grama are the dominant vegetation, practices such as scalping or shallow chiseling can be used to improve the rangeland. Such practices increase water infiltration, reduce plant competition, and allow the more desirable native plants to increase.

Windbreaks.—The Telstad soil is well suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian elm, white willow, golden willow, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, skunkbush sumac, and silver buffaloberry.

The Thoeny soil is poorly suited to windbreaks. It is salt- and sodium-affected, which limits the choice of trees and shrubs to Russian-olive and silver buffaloberry.

Homesite development.—These soils are poorly suited to homesite development. They are limited mainly by slow and very slow permeability, low soil strength, and shrink-swell potential. Buildings can be designed to offset the effects of shrinking and swelling. If these soils are used for septic tank absorption fields, the limitation of slow and very slow permeability can be overcome by increasing the size of the absorption field or by excavating the trench to a suitable depth. The field or trench should be backfilled with gravel. Shrinking and swelling and low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations.

This map unit is in capability subclass IVe, nonirrigated. The Telstad soil is in Silty range site, 10- to 14-inch precipitation zone, and the Thoeny soil is in Clay Pan range site, 10- to 14-inch precipitation zone.

137—Thoeny loam, 2 to 8 percent slopes. This deep, well drained, salt- and sodium-affected soil is on fans and foot slopes in the north-central and northeastern parts of the county. It formed in glacial till. Slopes are mainly less than 250 feet long. Elevation is 2,000 to 2,500 feet. The average annual precipitation is about 12 inches in the north-central part of the county and about 14 inches in the northeastern part. The average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Telstad, Hillon, and Absher soils in the north-central part of the county and Vida, Absher, and Zahill soils in the northeastern part. The salt- and sodium-affected Absher soils are on hillsides. They are low in productivity. The Telstad, Hillon, Vida, and Zahill soils do not adversely affect the use and management of this unit as rangeland and for nonirrigated crops.

Typically, this Thoeny soil has a surface layer of grayish brown loam 6 inches thick. The upper 6 inches of the subsoil is olive clay loam, and the lower 19 inches is grayish brown and olive gray clay. The substratum to a depth of 60 inches or more is grayish brown clay loam.

Permeability is very slow, and available water capacity is moderate. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 24 inches. Runoff is slow to medium, and the hazard of water erosion is slight to moderate. The hazard of soil blowing is

moderate. The soil is moderately salt- and sodium-affected at a depth of about 6 inches.

This soil is used mainly as rangeland. It is also used for nonirrigated farming. The main nonirrigated crops are wheat, oats, and barley.

Cropland.—This soil is poorly suited to nonirrigated crops. It is limited mainly by the hazards of soil blowing and water erosion and by the salt- and sodium-affected subsoil. The salts and sodium reduce the amount of moisture available for plant growth. Keeping tillage at a minimum not only maintains the tilth of the surface layer but also increases water infiltration and reduces the risk of erosion. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, stubble mulch tillage, and grassed waterways reduce soil blowing and water erosion.

Rangeland.—The potential native plant community is mainly western wheatgrass, green needlegrass, thickspike wheatgrass, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, blue grama, Sandberg bluegrass, fringed sagewort, and perennial forbs increases. If excessive grazing continues, plants such as annuals, weedlike forbs, and clubmoss may invade. The potential native plant community produces about 1,200 pounds per acre of air-dry vegetation in years of above-normal precipitation and 500 pounds in years of below-normal precipitation.

The surface layer is susceptible to water erosion and soil blowing if it is disturbed or the range is overgrazed. Proper grazing use insures good plant vigor and adequate plant cover. Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Where clubmoss or blue grama is the dominant vegetation, practices such as shallow chiseling and scalping can be used to improve the rangeland. Such practices increase water infiltration, reduce plant competition, and allow the more desirable native plants to increase.

Windbreaks.—This soil is poorly suited to windbreaks. It is salt- and sodium-affected, which limits the choice of trees and shrubs to Russian-olive and silver buffaloberry.

Homesite development.—This soil is poorly suited to homesite development. It is limited mainly by very slow permeability, low soil strength, and shrink-swell potential. Buildings can be designed to offset the effects of shrinking and swelling. This soil is poorly suited to septic tank absorption fields because of the very slow permeability. Shrinking and swelling and low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations.

This map unit is in capability subclass IVs, nonirrigated. It is in Clay Pan range site, 10- to 14-inch precipitation zone.

138—Thoeny-Absher complex, 2 to 8 percent slopes. This map unit is on glaciated uplands in the north-central and northeastern parts of the county. Slopes are mainly less than 250 feet long. Elevation is 2,000 to 2,500 feet. The average annual precipitation is about 12 inches in the north-central part of the county and about 14 inches in the northeastern part. The average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

This unit is about 50 percent Thoeny loam and 30 percent Absher clay loam. The Absher soil is in sparsely vegetated, shallow depressional areas surrounded by areas of the Thoeny soil.

Included in this unit are small areas of Telstad and Hillon soils in the north-central part of the county and Vida and Zahill soils in the northeastern part. Included areas make up about 20 percent of the total acreage. These areas do not adversely affect the use and management of this unit as rangeland and for nonirrigated farming.

The Thoeny soil is deep and well drained and is salt- and sodium-affected. It formed in glacial till. Typically, the surface layer is grayish brown loam 6 inches thick. The upper 6 inches of the subsoil is olive clay loam, and the lower 19 inches is grayish brown and olive gray clay. The substratum to a depth of 60 inches or more is grayish brown clay loam.

Permeability is very slow, and available water capacity is moderate. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 24 inches. Runoff is slow to medium, and the hazard of water erosion is slight to moderate. The hazard of soil blowing is moderate. This soil is moderately salt- and sodium-affected at a depth of about 6 inches.

The Absher soil is deep and well drained and is salt- and sodium-affected. It formed in glacial till. Typically, the surface layer, where mixed to a depth of 7 inches, is grayish brown clay loam. A thin, hard crust is on the surface. The subsoil is mostly light brownish gray clay loam and clay 20 inches thick. The substratum to a depth of 60 inches or more is mostly light brownish gray clay loam.

Permeability is very slow, and available water capacity is moderate. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 20 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate. This soil is moderately salt-affected and strongly sodium-affected at a depth of about 5 inches.

These soils are used mainly as rangeland. They are also used for nonirrigated farming. The main nonirrigated crops are wheat, oats, and barley.

Cropland.—These soils are poorly suited to nonirrigated crops because they have a salt- and sodium-affected subsoil. The salts and sodium restrict

penetration by roots and reduce the availability of moisture and nutrients. The percentage of seedlings that emerge is reduced by a hard crust that forms on the surface of the soils as they dry following heavy rainfall. Returning crop residue to the soils or regularly adding other organic matter improves fertility, reduces crusting, and increases the water intake rate. Minimum tillage, contour cultivation, grassed waterways, and stubble mulch tillage reduce soil blowing, runoff, and water erosion.

Rangeland.—The potential native plant community on the Thoeny soil is mainly western wheatgrass, green needlegrass, thickspike wheatgrass, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, blue grama, perennial forbs, and fringed sagewort increases. If excessive grazing continues, plants such as annuals, weedlike forbs, and clubmoss may invade. The potential native plant community produces about 1,200 pounds per acre of air-dry vegetation in years of above-normal precipitation and 500 pounds in years of below-normal precipitation.

The potential native plant community on the Absher soil is mainly western wheatgrass, green needlegrass, Montana wheatgrass, winterfat, and Nuttall saltbush. If the range is excessively grazed, the proportion of these plants decreases and the proportion of blue grama, Sandberg bluegrass, perennial forbs, and fringed sagewort increases. If excessive grazing continues, plants such as annuals, weedlike forbs, and clubmoss may invade. The potential native plant community produces about 800 pounds per acre of air-dry vegetation in years of above-normal precipitation and 400 pounds in years of below-normal precipitation.

Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Where clubmoss and blue grama are the dominant vegetation, practices such as scalping or shallow chiseling can be used to improve the rangeland. Such practices increase water infiltration, reduce plant competition, and allow the more desirable native plants to increase.

Windbreaks.—These soils are poorly suited to windbreaks. They are salt- and sodium-affected, which limits the choice of trees and shrubs to Russian-olive and silver buffaloberry.

Homesite development.—These soils are poorly suited to homesite development. They are limited mainly by very slow permeability, low soil strength, and shrink-swell potential. In the construction of basements or foundations for dwellings, the limitation of shrink-swell potential can be overcome by backfilling with suitable material that has low shrink-swell potential. These soils are poorly suited to septic tank absorption fields because of the very slow permeability. Shrinking and swelling and low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations.

This map unit is in capability subclass IVs, nonirrigated. The Thoeny soil is in Clay Pan range site, 10- to 14-inch precipitation zone, and the Absher soil is in Dense Clay range site, 10- to 14-inch precipitation zone.

139—Trembles fine sandy loam. This deep, well drained soil is on low terraces and flood plains of the Missouri and Redwater Rivers and their tributaries, in the eastern part of the county. It formed in alluvium. Slope is 0 to 2 percent. Slopes are mainly less than 1,000 feet long. Elevation is 1,900 to 2,600 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Ridgelawn, Havrelon, and Banks soils. Also included are small areas of soils on short, steep slopes along terrace edges; these areas can be farmed around. The Ridgelawn, Havrelon, and Banks soils do not adversely affect the use and management of this unit as rangeland and for nonirrigated and irrigated farming.

Typically, this Trembles soil has a surface layer of grayish brown fine sandy loam 6 inches thick. The underlying material to a depth of 60 inches or more is yellowish brown and light brownish gray fine sandy loam.

Permeability is moderately rapid, and available water capacity is moderate. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 36 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high. This soil is subject to rare periods of flooding during prolonged, high intensity storms. Channeling and deposition are common along streambanks.

This soil is used mainly for nonirrigated and irrigated farming. It is also used as rangeland. The main nonirrigated and irrigated crops are wheat, oats, and barley. Irrigated alfalfa hay is also grown.

Cropland.—This soil is well suited to nonirrigated and irrigated crops. It is limited mainly by moderate available water capacity and the hazard of soil blowing. Because of the droughtiness of the soil, successful crop production depends on receiving average or above-average rainfall during the early part of the growing season. Minimum tillage, tall grass barriers, stripcropping, and stubble mulch tillage conserve moisture and reduce soil blowing.

In summer, irrigation is required for maximum production of most crops. Furrow, border, corrugation, and sprinkler irrigation systems are suited to this soil. Because the soil is droughty, light and frequent applications of irrigation water are needed. Leveling is needed in sloping areas for the efficient application and removal of irrigation water.

Rangeland.—The potential native plant community is mainly prairie sandreed, little bluestem, big bluestem, and needleandthread. If the range is excessively grazed, the proportion of prairie sandreed, little bluestem, and big bluestem decreases and the proportion of needleandthread, thickspike wheatgrass, blue grama, silver sagebrush, and perennial forbs increases. If excessive grazing continues, plants such as Kentucky bluegrass, thistles, and annuals may invade. The potential native plant community produces about 2,000 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,200 pounds in years of below-normal precipitation.

Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Areas of deteriorated rangeland can be improved by mechanical treatment practices such as shallow chiseling and scalping. Special precautions may be needed to reduce soil blowing until the plant cover has reestablished.

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

Woodland.—This soil is suited to plains cottonwood. The site index for plains cottonwood is 70. The potential annual production (CMAI) per acre is about 35 cubic feet or 180 board feet (Scribner rule). Potential production is for an even-aged, fully stocked stand of trees.

The main limitation for timber management is the difficulty of reestablishing stands of plains cottonwood. The understory vegetation competes vigorously with tree seedlings for the limited amount of available water. Shelterwood and selection silvicultural harvesting systems improve regeneration. Immediate site preparation and planting after harvest also may help.

Where this soil is forested, the composition and yield of the plants in the forest understory are different from those of plants on rangeland. Yield is reduced as the overstory tree canopy increases. The potential native forest understory plants beneath a fully stocked stand of plains cottonwood are prairie sandreed, Canada wildrye, slender wheatgrass, common chokecherry, snowberry, Woods rose, field horsetail, green ash, Rocky Mountain juniper, poison-ivy, American licorice, and western meadowrue.

Homesite development.—This soil is poorly suited to homesite development because of the hazard of rare flooding.

This map unit is in capability subclass IIIe, nonirrigated and irrigated. It is in Sandy range site, 10- to 14-inch precipitation zone.

140—Trembles fine sandy loam, protected. This deep, well drained soil is on high terraces along the Missouri River, in the northeastern part of the county. It formed in alluvium. Slope is 0 to 2 percent. Slopes are mainly more than 1,000 feet long. Elevation is 1,900 to 2,100 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Havrelon, Lohler, Banks, and Hoffmanville soils. Also included are small areas of soils on short, steep slopes along terrace edges; these areas can be farmed around. The Havrelon, Lohler, Banks, and Hoffmanville soils do not adversely affect the use and management of this unit as rangeland and for nonirrigated and irrigated farming.

Typically, this Trembles soil has a surface layer of grayish brown fine sandy loam 6 inches thick. The underlying material to a depth of 60 inches or more is yellowish brown and light brownish gray fine sandy loam.

Permeability is moderately rapid, and available water capacity is moderate. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 36 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high. This soil is protected from flooding by Fort Peck Dam.

This soil is used mainly for nonirrigated and irrigated farming. It is also used as rangeland. The main nonirrigated and irrigated crops are wheat, oats, and barley. Irrigated alfalfa hay is also grown.

Cropland.—This soil is well suited to nonirrigated and irrigated crops. It is limited mainly by moderate available water capacity and the hazard of soil blowing. Because of the droughtiness of the soil, successful crop production depends on receiving average or above-average rainfall during the early part of the growing season. Minimum tillage, tall grass barriers, stripcropping, and stubble mulch tillage conserve moisture.

In summer, irrigation is required for maximum production of most crops. Furrow, border, corrugation, and sprinkler irrigation systems are suited to this soil. Because the soil is droughty, light and frequent applications of irrigation water are needed. Leveling is needed in sloping areas for the efficient application and removal of irrigation water.

Rangeland.—The potential native plant community is mainly prairie sandreed, little bluestem, big bluestem, and needleandthread. If the range is excessively grazed, the proportion of prairie sandreed, little bluestem, and big bluestem decreases and the proportion of needleandthread, thickspike wheatgrass, blue grama, silver sagebrush, and perennial forbs increases. If excessive grazing continues, plants such as Kentucky bluegrass, thistles, and annuals may invade. The potential native plant community produces about 1,800 pounds per acre of air-dry vegetation in years of above-

normal precipitation and 1,200 pounds in years of below-normal precipitation.

Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Areas of deteriorated rangeland can be improved by mechanical treatment practices such as shallow chiseling and scalping. Special precautions may be needed to reduce soil blowing until the plant cover is reestablished.

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

Woodland.—This soil is suited to plains cottonwood. The site index for plains cottonwood is 65. The potential annual production (CMAI) per acre is about 30 cubic feet or 160 board feet (Scribner rule). Potential production is for an even-aged, fully stocked stand of trees.

The main limitation for timber management is the difficulty of reestablishing stands of plains cottonwood. The understory vegetation competes vigorously with tree seedlings for the limited amount of available water. Shelterwood and selection silvicultural harvesting systems improve regeneration. Immediate site preparation and planting after harvest also may help.

Where this soil is forested, the composition and yield of the plants in the forest understory are different from those of plants on rangeland. Yield is reduced as the overstory tree canopy increases. The potential native forest understory plants beneath a fully stocked stand of plains cottonwood are prairie sandreed, Canada wildrye, slender wheatgrass, common chokecherry, snowberry, Woods rose, field horsetail, green ash, Rocky Mountain juniper, poison-ivy, American licorice, and western meadowrue.

Homesite development.—This soil is well suited to homesite development. It has few limitations. In places, excavation for roads can expose material that is highly susceptible to soil blowing.

This map unit is in capability subclass IIIe, nonirrigated and irrigated. It is in Sandy range site, 10- to 14-inch precipitation zone.

141—Turner loam, 0 to 4 percent slopes. This deep, well drained soil is on fans and terraces in the southeastern and northeastern parts of the county. It formed in alluvium. Slopes are mainly more than 1,000 feet long. Elevation is 1,900 to 3,400 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Shambo, Wabek, Farnuf, and Vida soils. The Wabek soils have very gravelly sand within 7 to 15 inches of the surface. They are droughty and are low in productivity. The Shambo, Farnuf, and Vida soils do not adversely affect the use and management of this unit for nonirrigated farming and as rangeland.

Typically, this Turner soil has a surface layer of brown loam 7 inches thick. The upper 7 inches of the subsoil is dark grayish brown clay loam, and the lower 14 inches is grayish brown and light brownish gray loam. The upper 5 inches of the substratum is light brownish gray gravelly loam, and the lower part to a depth of 60 inches or more is light olive brown very gravelly loamy sand. Very gravelly loamy sand is at a depth of 30 to 40 inches.

Permeability is moderate to a depth of 33 inches and rapid below this depth. Available water capacity is moderate. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 30 inches. Runoff is slow to medium, and the hazard of water erosion is slight to moderate. The hazard of soil blowing is moderate.

This soil is used as rangeland and for nonirrigated farming. The main nonirrigated crops are wheat, oats, and barley. If this soil is irrigated, it is prime farmland.

Cropland.—This soil is well suited to nonirrigated crops. It is limited mainly by the hazards of soil blowing and water erosion. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, stubble mulch tillage, and grassed waterways reduce soil blowing and water erosion.

Rangeland.—The potential native plant community is mainly western wheatgrass, green needlegrass, little bluestem, bluebunch wheatgrass, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, perennial short grasses, threadleaf sedge, fringed sagewort, silver sagebrush, and perennial forbs increases. If excessive grazing continues, plants such as annuals, weedlike forbs, and Kentucky bluegrass may invade. The potential native plant community produces about 1,800 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,200 pounds in years of below-normal precipitation.

The surface layer is susceptible to water erosion and soil blowing if it is disturbed or the range is overgrazed. Proper grazing use insures good plant vigor and adequate plant cover. Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Areas of deteriorated rangeland can be improved by mechanical treatment practices such as shallow chiseling and scalping.

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

Homesite development.—This soil is suited to homesite development. It has few limitations. Because

the substratum is rapidly permeable, effluent from septic tank absorption fields may contaminate ground water.

This map unit is in capability subclass IIIe, nonirrigated. It is in Silty range site, 10- to 14-inch precipitation zone.

142—Twilight-Yetull fine sandy loams, 8 to 15 percent slopes. This map unit is on foot slopes, side slopes, and tops of hills and ridges in the western part of the county. Slopes are mainly less than 1,000 feet long. Elevation is 1,900 to 2,600 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

This unit is about 45 percent Twilight fine sandy loam and 35 percent Yetull fine sandy loam. The Twilight soil is on the upper side slopes and tops of hills and ridges, and the Yetull soil is on foot slopes and in areas protected from the prevailing winds.

Included in this unit are small areas of Cabbart, Fleak, Rominell, and Yamac soils and sandstone outcroppings. Included areas make up about 20 percent of the total acreage. The areas of soil do not adversely affect the use and management of this unit as rangeland. The areas of sandstone outcroppings limit the range production of the unit.

The Twilight soil is moderately deep and well drained. It formed in material derived from weakly consolidated, sandy sedimentary beds. Typically, the surface layer is brown fine sandy loam 5 inches thick. The upper 5 inches of the subsoil is brown fine sandy loam, and the lower 6 inches is pale brown fine sandy loam. The substratum to a depth of 25 inches is light brownish gray sandy loam. Below this to a depth of 60 inches or more are light brownish gray, weakly consolidated, sandy sedimentary beds. Sedimentary beds are at a depth of 20 to 40 inches.

Permeability is moderately rapid, and available water capacity is low. Effective rooting depth is limited by the sedimentary beds at a depth of 20 to 40 inches. Where this soil is under native vegetation, the average annual wetting depth is 20 to 30 inches. Runoff is slow to medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high. This soil is droughty.

The Yetull soil is deep and somewhat excessively drained. It formed in sandy alluvial and eolian material. Typically, the surface layer is light brownish gray fine sandy loam 6 inches thick. The underlying material to a depth of 60 inches or more is light brownish gray loamy sand.

Permeability is rapid, and available water capacity is low. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 36 inches. Runoff is slow, and the hazard of water erosion is moderate. The hazard of soil blowing is high. This soil is droughty.

These soils are used as rangeland.

Cropland.—These soils are poorly suited to cultivated crops because of the high hazard of soil blowing and droughtiness of the soils.

Rangeland.—The potential native plant community on the Twilight soil is mainly prairie sandreed, little bluestem, needleandthread, and thickspike wheatgrass. If the range is excessively grazed, the proportion of prairie sandreed and little bluestem decreases and the proportion of needleandthread, thickspike wheatgrass, perennial short grasses, threadleaf sedge, and perennial forbs increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,800 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,000 pounds in years of below-normal precipitation.

The potential native plant community on the Yetull soil is mainly sand bluestem, prairie sandreed, Indian ricegrass, little bluestem, and sun sedge. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, sand dropseed, perennial short grasses, threadleaf sedge, perennial forbs, and yucca increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 2,000 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,000 pounds in years of below-normal precipitation.

The surface layer of these soils is susceptible to water erosion and soil blowing if it is disturbed or the range is overgrazed. Proper grazing use insures good plant vigor and adequate plant cover. Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. These soils are poorly suited to practices such as chiseling and scalping because they are droughty and are more susceptible to soil blowing and water erosion if they are disturbed. Reestablishing plant cover is difficult.

Windbreaks.—These soils are suited to windbreaks, but the low available water capacity limits the growth of both trees and shrubs. Suitable trees for planting are Russian-olive, Siberian elm, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, western sandcherry, and skunkbush sumac.

Homesite development.—These soils are suited to homesite development. They have few limitations. Slope is a concern in installing septic tank absorption fields. Absorption lines should be installed on the contour. In places, excavation for roads can expose material that is highly susceptible to soil blowing. If the Yetull soil is used for septic tank absorption fields, the rapid permeability may cause pollution of the ground water.

This map unit is in capability subclass VIe, nonirrigated. The Twilight soil is in Sandy range site, 10- to 14-inch precipitation zone, and the Yetull soil is in Sands range site, 10- to 14-inch precipitation zone.

143—Typic Fluvaquents, frequently flooded. These deep, poorly drained soils are on flood plains of the Missouri and Redwater Rivers and their major tributaries. The soils are in the northern and southeastern parts of the county. They formed in sandy and gravelly alluvium. Slope is 0 to 2 percent. Elevation is 1,900 to 2,500 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Typic Fluvaquents, saline, and Hanly, Banks, and Ridgelawn soils. These areas do not adversely affect the use and management of this unit for wildlife habitat.

Typic Fluvaquents do not have a typical profile. Generally, Typic Fluvaquents along the Redwater River consist of erratically stratified, nearly barren bars of gravel and sand. Along the Missouri River, Prairie Elk Creek, and Sand Creek, they consist of bars of sand stratified with thin lenses of loam and silt loam. Along the Missouri River these bars have been stabilized by willows and brushy vegetation.

These soils are subject to frequent periods of flooding during high intensity storms. Channeling and deposition are common along streambanks. The soils have a water table from 1 foot above the surface to 1 foot below the surface late in winter and in spring.

These soils are used as wildlife habitat. They are not suited to cultivated crops, rangeland, windbreaks, or homesite development because of the frequent periods of flooding. The vegetation on the unit is highly diverse. Along the Redwater River the unit is a limited source of sand and gravel for building and surfacing roads.

This map unit is in capability subclass VIIw. It has not been assigned to a range site.

144—Typic Fluvaquents, saline. These deep, poorly drained, salt-affected soils are on the bottoms of drainageways and narrow flood plains throughout the county. They formed in alluvium derived from local material. Slope is 0 to 2 percent. Elevation is 1,900 to 3,400 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Fleak, Yawdim, Havre, and Glendive soils in the western part of the county and Cabba, Dast, Havrelon, and Trembles soils in the eastern part. These areas do not adversely affect the use and management of this unit as rangeland.

Typic Fluvaquents, saline, do not have a typical profile. They are erratically stratified sandy loam to silty clay.

Permeability is slow to moderate, and available water capacity is moderate or low. The effective rooting depth varies with the depth to the water table. These soils have a water table at the surface to a depth of 2 feet from late in winter through spring and are moist most of the rest of the year. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high. These soils are subject to occasional periods of flooding during high intensity storms and during spring runoff. They are strongly salt-affected near the surface.

These soils are used as rangeland.

Cropland.—These soils are not suited to cultivated crops because of the high salt content and impracticability of effectively farming the small, odd-shaped areas.

Rangeland.—The potential native plant community is mainly alkali cordgrass, alkali sacaton, Nuttall alkaligrass, Nuttall saltbush, tall sedges, and alkali bluegrass. If the range is excessively grazed, the proportion of these plants decreases and the proportion of western wheatgrass, inland saltgrass, and bottlebrush squirreltail increases. If excessive grazing continues, plants such as foxtail barley, annual saltbush, and other annuals and weedlike forbs may invade. The potential native plant community produces about 3,300 pounds per acre of air-dry vegetation in years of above-normal precipitation and 2,000 pounds in years of below-normal precipitation.

Grazing should be delayed until the soils are firm and the more desirable forage plants have achieved sufficient growth to withstand grazing pressure. With increased grazing use, these soils may become more salty and thus produce less forage. Only the more salt-tolerant plants will survive. These soils are not suited to seeding or mechanical treatment practices because of the high salt content and the hazard of flooding.

Windbreaks.—These soils are poorly suited to windbreaks because of the high salt content and wetness.

Homesite development.—These soils are poorly suited to homesite development because of the hazard of occasional flooding.

This map unit is in capability subclass VIIw, nonirrigated. It is in Saline Lowland range site, 10- to 14-inch precipitation zone.

145—Typic Ustifluvents, saline. These deep, well drained, strongly salt-affected soils are on flood plains and coulee bottoms in the northern part of the county. They formed in alluvium. Slope is 0 to 2 percent. Elevation is 1,900 to 2,500 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Typic Fluvaquents, saline; Havrelon soils, saline; and Havre and Glendive soils. These areas do not adversely affect the use and management of this unit as rangeland.

Typic Ustifluvents, saline, do not have a typical profile. They are erratically stratified sandy loam to clay loam.

Permeability is slow to moderately rapid, and available water capacity is low to moderate. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil

blowing is high. This soil is subject to occasional periods of flooding during prolonged, high intensity storms and during spring runoff. Channeling and deposition are common along streambanks. These soils are strongly salt-affected throughout.

These soils are used as rangeland.

Cropland.—These soils are not suited to cultivated crops because of the high content of salts and the hazard of occasional flooding.

Rangeland.—The potential native plant community is mainly alkali cordgrass, alkali sacaton, Nuttall alkaligrass, Nuttall saltbush, tall sedges, and alkali bluegrass. If the range is excessively grazed, the proportion of these plants decreases and the proportion of western wheatgrass, inland saltgrass, and bottlebrush squirreltail increases. If excessive grazing continues, plants such as foxtail barley, annual saltbush, other annuals, and weedlike forbs may invade. The potential native plant community produces about 3,300 pounds per acre of air-dry vegetation in years of above-normal precipitation and 2,000 pounds in years of below-normal precipitation.

Grazing should be delayed until the soils are firm and the more desirable forage plants have achieved sufficient growth to withstand grazing pressure. With increased grazing use, these soils may become more salty and thus produce less forage. Only the more salt-tolerant plant species will grow. These soils are not suited to seeding or mechanical treatment practices because of the high content of salts and the hazard of flooding.

Windbreaks.—These soils are not suited to windbreaks. They are limited mainly by the high content of salts.

Homesite development.—These soils are poorly suited to homesite development because of the hazard of occasional flooding.

This map unit is in capability subclass VIIw, nonirrigated. It is in Saline Lowland range site, 10- to 14-inch precipitation zone.

146—Typic Ustorthents-Typic Ustifluvents association. This map unit is on uplands and flood plains in the eastern part of the county. Slope is 2 to 45 percent. Slopes are mainly less than 250 feet long. Elevation is 1,900 to 2,500 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

This unit is about 45 percent Typic Ustorthents and 40 percent Typic Ustifluvents. The strongly sloping to steep Typic Ustorthents are on the sides of coulees and narrow drainageways, and the gently sloping to moderately sloping Typic Ustifluvents are on the bottoms of coulees and narrow drainageways.

Included in this unit are small areas of Typic Fluvaquents, saline, and Trembles, Havrelon, Cabba, and Zahill soils. Also included are small areas of sandstone and shale outcroppings. Included areas make up about 15 percent of the total acreage. These areas do not adversely affect the use and management of this unit as rangeland.

Typic Ustorthents do not have a typical profile; texture ranges from loam to silty clay. They are deep to very shallow, well drained soils that are underlain by weakly consolidated sedimentary beds, semiconsolidated shale, or consolidated shale. Depth to root-limiting material ranges from less than 10 inches to more than 60 inches.

Permeability is slow to moderate, and available water capacity is very low to high. Effective rooting depth varies with depth to root-limiting material. Runoff is medium to very rapid, and the hazard of water erosion is moderate to high. The hazard of soil blowing is moderate to high.

Typic Ustifluvents do not have a typical profile; texture ranges from sandy loam to clay. These soils are deep and are well drained to somewhat poorly drained. They formed in alluvium derived from local sources.

Permeability is slow to moderately rapid, and the available water capacity is high. Effective rooting depth varies with depth to the water table. Some areas of these soils have a seasonal or permanent high water table. Runoff is slow to medium, and the hazard of water erosion is slight to moderate. The hazard of soil blowing is slight to high. These soils are subject to occasional periods of flooding during high intensity storms and during spring runoff.

These soils are used as rangeland.

Cropland.—These soils are not suited to cultivated crops because the areas on bottoms are too narrow to effectively cultivate and the areas on side slopes are too steep or too droughty.

Rangeland.—The potential native plant community on the Typic Ustorthents is mainly prairie sandreed, western wheatgrass, green needlegrass, and plains muhly. If the range is excessively grazed, the proportion of these grasses decreases and the proportion of needleandthread, perennial short grasses, and perennial forbs increases. If excessive grazing continues, plants such as broom snakeweed, annuals, and weedlike forbs may invade. The potential native plant community produces about 1,600 pounds per acre of air-dry vegetation in years of above-normal precipitation and 800 pounds in years of below-normal precipitation.

The potential native plant community on the Typic Ustifluvents is mainly little bluestem, green needlegrass, prairie sandreed, slender wheatgrass, and Canada wildrye. If the range is excessively grazed, the proportion of these grasses decreases and the proportion of western wheatgrass, needleandthread, perennial forbs, and silver sagebrush increases. If excessive grazing continues, plants such as annuals, thistles, Kentucky bluegrass, and weedlike forbs may invade. The potential native plant community produces about 3,000 pounds per acre of air-dry vegetation in years of above-normal

precipitation and 2,000 pounds in years of below-normal precipitation.

Grazing should be delayed until the soils are firm and the more desirable forage plants have achieved sufficient growth to withstand grazing pressure. If the plant cover is disturbed by overgrazing, special protection may be needed on the Ustifluvents to prevent damage from gullying and sheet erosion during periods of runoff. These soils are not suited to seeding or mechanical treatment because of the steepness of slope in some areas of the Typic Ustorthents and the hazard of water erosion on the Typic Ustifluvents.

Windbreaks.—These soils are poorly suited to windbreaks. Trees and shrubs are difficult to select because of the variability of the soils and are difficult to plant and maintain because of the steepness of slope and possibility of a high water table in the bottoms.

Homesite development.—These soils are poorly suited to homesite development. Typic Ustorthents are limited mainly by steepness of slope, and Typic Ustifluvents are limited mainly by the hazard of occasional flooding.

This map unit is in capability subclass VIIe, nonirrigated. The Typic Ustorthents are in Thin Silty range site, 10- to 14-inch precipitation zone, and the Typic Ustifluvents are in Overflow range site, 10- to 14-inch precipitation zone.

147—Ustic Torriorthents-Ustic Torrifluvents association. This map unit is on uplands and flood plains in the western part of the county. Slope is 2 to 45 percent. Elevation is 1,900 to 2,600 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

This unit is about 45 percent Ustic Torriorthents and 40 percent Ustic Torrifluvents. The strongly sloping to steep Ustic Torriorthents are on the sides of coulees and narrow drainageways, and the gently sloping to moderately sloping Ustic Torrifluvents are on the bottoms of coulees and narrow drainageways.

Included in this unit are small areas of Typic Fluvaquents, saline, and Glendive, Havre, Cabbart, and Yawdim soils. Also included are small areas of sandstone and shale outcroppings. Included areas make up about 15 percent of the total acreage. The areas of soil do not adversely affect the use and management of this unit as rangeland. The areas of sandstone and shale outcroppings limit the range production of the unit.

Ustic Torriorthents do not have a typical profile; texture ranges from sandy loam to silty clay. They are deep to very shallow, well drained soils that are underlain by weakly consolidated sedimentary beds, semiconsolidated shale, or consolidated shale. Depth to root-limiting material ranges from less than 10 inches to more than 60 inches.

Permeability is slow to moderate, and available water capacity is very low to high. Effective rooting depth varies with the depth to root-limiting material. Runoff is medium to very rapid, and the hazard of water erosion is moderate to high. The hazard of soil blowing is moderate to high.

Ustic Torrifluvents do not have a typical profile; texture ranges from sandy loam to clay. These soils are deep and well drained to somewhat poorly drained. They formed in alluvium derived from local sources.

Permeability ranges from slow to moderately rapid, and available water capacity is high. Effective rooting depth varies with depth to the water table. In some areas these soils have a seasonal or permanent high water table. Runoff is slow to medium, and the hazard of water erosion is slight to moderate. The hazard of soil blowing is slight to high. These soils are subject to occasional periods of flooding during high intensity storms and during spring runoff.

These soils are used as rangeland.

Cropland.—These soils are not suited to cultivated crops because the areas on bottoms are too narrow to effectively cultivate and the areas on side slopes are too steep or too droughty.

Rangeland.—The potential native plant community on the Ustic Torriorthents is mainly little bluestem, prairie sandreed, western wheatgrass, green needlegrass, and plains muhly. If the range is excessively grazed, the proportion of these grasses decreases and the proportion of needleandthread, perennial short grasses, and perennial forbs increases. If excessive grazing continues, plants such as broom snakeweed, annuals, and weedlike forbs may invade. The potential native plant community produces about 1,200 pounds per acre of air-dry vegetation in years of above-normal precipitation and 600 pounds in years of below-normal precipitation.

The potential native plant community on the Ustic Torrifluvents is mainly little bluestem, green needlegrass, prairie sandreed, slender wheatgrass, and Canada wildrye. If the range is excessively grazed, the proportion of these grasses decreases and the proportion of western wheatgrass, needleandthread, perennial forbs, and silver sagebrush increases. If excessive grazing continues, plants such as annuals, thistles, Kentucky bluegrass, and weedlike forbs may invade. The potential native plant community produces about 3,000 pounds per acre of air-dry vegetation in years of above-normal precipitation and 2,000 pounds in years of below-normal precipitation.

Grazing should be delayed until the soils are firm and the more desirable forage plants have achieved sufficient growth to withstand grazing pressure. These soils are not suited to seeding or mechanical treatment because of the steepness of slope in some areas of the Ustic Torriorthents and the hazard of water erosion on the Ustic Torrifluvents.

Windbreaks.—These soils are poorly suited to windbreaks. Trees and shrubs are difficult to select

because of the variability of the soils and are difficult to plant and maintain because of the steepness of slope and the possibility of a high water table in the bottoms.

Homesite development.—These soils are poorly suited to homesite development. Ustic Torriorthents are limited mainly by steepness of slope, and Ustic Torrifluvents are limited mainly by the hazard of occasional flooding.

This map unit is in capability subclass VIIe, nonirrigated. The Ustic Torriorthents are in Thin Silty range site, 10- to 14-inch precipitation zone, and the Ustic Torrifluvents are in Overflow range site, 10- to 14-inch precipitation zone.

148—Vanda clay, 0 to 8 percent slopes. This deep, well drained, strongly salt- and sodium-affected soil is on fans and terraces in the northern part of the county. It formed in alluvium. Slopes are mainly 250 feet to more than 1,000 feet long. Elevation is 1,900 to 2,600 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Marvan, Gerdrum, and Neldore soils. Also included are small areas of noncalcareous soils that are similar to this Vanda soil and are on fans and terraces along the Missouri Breaks. These areas do not adversely affect the use and management of this unit as rangeland.

Typically, this Vanda soil has a surface layer of light gray clay 2 inches thick. A thin, hard crust is on the surface. The upper 9 inches of the underlying material is light olive gray clay, and the lower part to a depth of 60 inches or more is grayish brown clay.

Permeability is very slow, and available water capacity is moderate. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 24 inches. Runoff is slow to medium, and the hazard of water erosion is slight to moderate. The hazard of soil blowing is moderate. This soil is strongly salt- and sodium-affected at a depth of about 2 inches.

This soil is used as rangeland.

Cropland.—This soil is poorly suited to cultivated crops because the strongly salt- and sodium-affected underlying material reduces the amount of water available to plants and restricts penetration by roots and moisture. These characteristics drastically limit crop yields.

Rangeland.—The potential native plant community is mainly western wheatgrass, green needlegrass, Montana wheatgrass, winterfat, and Nuttall saltbush. If the range is excessively grazed, the proportion of these plants decreases and the proportion of blue grama, Sandberg bluegrass, low sagebrush, and greasewood increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,000 pounds per acre of air-dry vegetation in years of above-normal precipitation and 600 pounds in years of below-normal precipitation.

This soil is very poorly suited to seeding because of the high content of salts and sodium.

Windbreaks.—This soil is not suited to windbreaks. It is limited mainly by the clayey texture and the high content of salts and sodium.

Homesite development.—This soil is poorly suited to homesite development. It is limited mainly by very slow permeability, shrink-swell potential, and low soil strength. Buildings can be designed to offset the effects of shrinking and swelling. This soil is poorly suited to septic tank absorption fields because of the very slow permeability. Shrinking and swelling and low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations.

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

149—Vida clay loam, 0 to 2 percent slopes. This deep, well drained soil is on upland benches and in swales in the northeastern part of the county. It formed in glacial till. Slopes are mainly more than 1,000 feet long. Elevation is 2,000 to 2,500 feet. The average annual precipitation is about 15 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Williams, Shambo, and Zahill soils. The Zahill soils are on the tops of low hills and knolls. They are highly susceptible to soil blowing. The Williams and Shambo soils do not adversely affect the use and management of this unit as rangeland and for nonirrigated farming.

Typically, this Vida soil, where mixed to a depth of 7 inches, has a surface layer of brown clay loam. The upper 2 inches of the subsoil is brown clay loam, and the lower 10 inches is light brownish gray loam. The substratum to a depth of 60 inches or more is light gray clay loam.

Permeability is moderately slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 30 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate. The soil is calcareous below a depth of about 9 inches.

This soil is used mainly for nonirrigated farming. It is also used as rangeland. The main nonirrigated crops are wheat, oats, and barley.

Cropland.—This soil is well suited to nonirrigated crops. It is limited mainly by the hazard of soil blowing. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, and stubble mulch tillage reduce soil blowing.

In the area north and east of Vida, especially in the vicinity of Montana Highway 201 and in the Wolf Creek drainageway, this soil is susceptible to formation of saline seeps. Suitable practices for reducing the development of saline seeps are using flexible cropping systems, seeding legumes in recharge areas, and providing surface and subsurface drainage where needed.

Rangeland.—The potential native plant community is mainly western wheatgrass, little bluestem, bluebunch wheatgrass, plains muhly, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, perennial short grasses, fringed sagewort, and perennial forbs increases. If excessive grazing continues, plants such as annuals, weedlike forbs, and clubmoss may invade. The potential native plant community produces about 1,800 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,200 pounds in years of below-normal precipitation.

Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Where clubmoss and blue grama are the dominant vegetation, practices such as scalping or shallow chiseling can be used to improve the rangeland. Such practices increase water infiltration, reduce plant competition, and allow the more desirable native plants to increase.

Windbreaks.—This soil is well suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian elm, white willow, golden willow, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, skunkbush sumac, and silver buffaloberry.

Homesite development.—This soil is poorly suited to homesite development. It is limited mainly by moderately slow permeability, low soil strength, and shrink-swell potential. In the construction of basements or foundations for dwellings, the limitation of shrink-swell potential can be overcome by backfilling with suitable material that has low shrink-swell potential. If this soil is used for septic tank absorption fields, use of gravel backfill in the absorption line trench, excavated to a suitable depth, helps to compensate for the limitation of moderately slow permeability. Shrinking and swelling and low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations.

This map unit is in capability subclass IIIe, nonirrigated. It is in Silty range site, 10- to 14-inch precipitation zone.

150—Vida clay loam, 2 to 8 percent slopes. This deep, well drained soil is on rolling glaciated uplands in the northeastern part of the county. It formed in glacial till. Slopes are mainly less than 1,000 feet long. Elevation is 2,000 to 2,500 feet. The average annual precipitation is about 15 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Zahill, Cambert, Thoeny, and Yawdim soils. The Zahill soils are on the tops of low hills; they are highly susceptible to soil blowing. The Cambert soils are on the upper side slopes of low hills and are moderately deep to root-limiting, sedimentary beds. The salt- and sodium-affected Thoeny soils are in shallow depressional areas on fans and foot slopes. The salts and sodium reduce the moisture and nutrients available to plants and thus limit crop yields. The shallow Yawdim soils are on the side slopes and tops of low hills. They are underlain by root-limiting semiconsolidated shale. The Yawdim soils may have an influence on saline seep development in this area.

Typically, this Vida soil, where mixed to a depth of 7 inches, has a surface layer of brown clay loam. The upper 2 inches of the subsoil is brown clay loam, and the lower 10 inches is light brownish gray loam. The substratum to a depth of 60 inches or more is light gray clay loam.

Permeability is moderately slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 30 inches. Runoff is slow to medium, and the hazard of water erosion is slight to moderate. The hazard of soil blowing is moderate. The soil is calcareous below a depth of about 9 inches.

This soil is used mainly for nonirrigated farming. It is also used as rangeland. The main nonirrigated crops are wheat, oats, and barley.

Cropland.—This soil is well suited to nonirrigated crops. It is limited mainly by the hazards of soil blowing and water erosion and by the potential for formation of saline seeps. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, stubble mulch tillage, and grassed waterways reduce soil blowing and water erosion.

In the area north and east of Vida, especially in the vicinity of Montana Highway 201 and in the Wolf Creek drainageway, this soil is susceptible to formation of saline seeps. Suitable practices for reducing the development of saline seeps are using flexible cropping systems, seeding legumes in recharge areas, and providing surface and subsurface drainage where needed.

Rangeland.—The potential native plant community is mainly western wheatgrass, little bluestem, bluebunch wheatgrass, plains muhly, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, perennial short grasses, fringed sagewort, and perennial forbs increases. If excessive grazing continues, plants such as annuals, weedlike forbs, and clubmoss may invade. The potential native plant community produces about 1,800 pounds per acre of air-dry vegetation in

years of above-normal precipitation and 1,200 pounds in years of below-normal precipitation.

The surface layer is susceptible to water erosion and soil blowing if it is disturbed or the range is overgrazed. Proper grazing use insures good plant vigor and adequate plant cover. Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Where clubmoss and blue grama are the dominant vegetation, practices such as scalping or shallow chiseling can be used to improve the rangeland. Such practices increase water infiltration, reduce plant competition, and allow the more desirable native plants to increase.

Windbreaks.—This soil is well suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian elm, white willow, golden willow, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, skunkbush sumac, and silver buffaloberry.

Homesite development.—This soil is poorly suited to homesite development. It is limited mainly by moderately slow permeability, low soil strength, and shrink-swell potential. In the construction of basements or foundations for dwellings, the limitation of shrink-swell potential can be overcome by backfilling with suitable material that has low shrink-swell potential. If this soil is used for septic tank absorption fields, use of gravel backfill in the absorption line trench, excavated to a suitable depth, helps to compensate for the limitation of moderately slow permeability. Shrinking and swelling and low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations.

This map unit is in capability subclass IIIe, nonirrigated. It is in Silty range site, 10- to 14-inch precipitation zone.

151—Vida-Zahill complex, 2 to 8 percent slopes. This map unit is on undulating to gently rolling glaciated uplands in the northeastern part of the county. Slopes are mainly less than 1,000 feet long. Elevation is 2,000 to 2,500 feet. The average annual precipitation is about 15 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

This unit is about 50 percent Vida clay loam and 35 percent Zahill loam. The Vida soil is on side slopes and in swales, and the Zahill soil is on the upper side slopes and tops of low hills.

Included in this unit are small areas of Cabba, Thoeny, and Yawdim soils. Included areas make up about 15 percent of the total acreage. The Cabba and Yawdim soils are droughty and are shallow. The salt- and sodium-affected Thoeny soils are in shallow depressional areas on fans and foot slopes. The salts and sodium reduce the availability of moisture and plant nutrients and thus limit crop yields.

The Vida soil is deep and well drained. It formed in glacial till. Typically, the surface layer, where mixed to a depth of 7 inches, is brown clay loam. The upper 2 inches of the subsoil is brown clay loam, and the lower 10 inches is light brownish gray loam. The substratum to a depth of 60 inches or more is light gray clay loam.

Permeability is moderately slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 30 inches. Runoff is slow to medium, and the hazard of water erosion is slight to moderate. The hazard of soil blowing is moderate. This soil is calcareous below a depth of about 9 inches.

The Zahill soil is deep and well drained. It formed in glacial till. Typically, the surface layer is brown loam 6 inches thick. The upper 16 inches of the underlying material is pale brown clay loam, and the lower part to a depth of 60 inches or more is light brownish gray clay loam.

Permeability is moderately slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 30 inches. Runoff is slow to medium, and the hazard of water erosion is slight to moderate. The hazard of soil blowing is high. This soil is calcareous throughout.

These soils are used mainly for nonirrigated farming. They are also used as rangeland. The main nonirrigated crops are wheat, oats, and barley.

Cropland.—These soils are well suited to nonirrigated crops. They are limited mainly by the hazards of soil blowing and water erosion and by the potential for formation of saline seeps. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, stubble mulch tillage, and grassed waterways reduce soil blowing and water erosion.

In the area north and east of Vida, especially in the vicinity of Montana Highway 201 and in the Wolf Creek drainageway, these soils are susceptible to formation of saline seeps. Suitable practices for reducing the development of saline seeps are using flexible cropping systems, seeding legumes in recharge areas, and providing surface and subsurface drainage where needed.

Rangeland.—The potential native plant community is mainly western wheatgrass, little bluestem, bluebunch wheatgrass, plains muhly, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, perennial short grasses, fringed sagewort, and perennial forbs increases. If excessive grazing continues, plants such as annuals, weedlike forbs, and clubmoss may invade. The potential native plant community produces about 1,800 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,200 pounds in years of below-normal precipitation.

The surface layer of these soils is susceptible to water erosion and soil blowing if it is disturbed or the range is overgrazed. Proper grazing use insures good plant vigor and adequate plant cover. Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Where clubmoss and blue grama are the dominant vegetation, practices such as scalping or shallow chiseling can be used to improve the rangeland. Such practices increase water infiltration, reduce plant competition, and allow the more desirable native plants to increase.

Windbreaks.—The Vida soil is well suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian elm, white willow, golden willow, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, skunkbush sumac, and silver buffaloberry.

The Zahill soil is suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian elm, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, and skunkbush sumac.

Homesite development.—These soils are poorly suited to homesite development. They are limited mainly by moderately slow permeability, low soil strength, and shrink-swell potential. In the construction of basements or foundations for dwellings, the limitation of shrink-swell potential can be overcome by backfilling with suitable material that has low shrink-swell potential. If these soils are used for septic tank absorption fields, use of gravel backfill in the absorption line trench, excavated to a suitable depth, helps to compensate for the limitation of moderately slow permeability. Shrinking and swelling and low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations.

This map unit is in capability subclass IIIe, nonirrigated. It is in Silty range site, 10- to 14-inch precipitation zone.

152—Vida-Zahill complex, 8 to 15 percent slopes. This map unit is on rolling glaciated uplands in the northeastern part of the county. Slopes are mainly less than 250 feet long. Elevation is 2,000 to 2,500 feet. The average annual precipitation is about 15 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

This unit is about 45 percent Vida clay loam and 40 percent Zahill loam. The Vida soil is on the lower side slopes of hills and ridges, and the Zahill soil is on the upper side slopes and tops of hills and ridges.

Included in this unit are small areas of Cabba, Macar, Thoeny, and Yawdim soils. Included areas make up about 15 percent of the total acreage. The Cabba and Yawdim soils are on the upper side slopes and tops of hills and ridges. These soils are droughty and are shallow to root-limiting material. The salt- and sodium-affected Thoeny soils are on fans and foot slopes. The salts and sodium reduce the availability of moisture and plant nutrients and thus limit crop yields. The Macar soils do not adversely affect the use and management of this unit as rangeland and for nonirrigated farming.

The Vida soil is deep and well drained. It formed in glacial till. Typically, the surface layer, where mixed to a depth of 7 inches, is brown clay loam. The upper 2 inches of the subsoil is brown clay loam, and the lower 10 inches is light brownish gray loam. The substratum to a depth of 60 inches or more is light gray clay loam.

Permeability is moderately slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 27 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate. This soil is calcareous below a depth of about 9 inches.

The Zahill soil is deep and well drained. It formed in glacial till. Typically, the surface layer is brown loam 6 inches thick. The upper 16 inches of the underlying material is pale brown clay loam, and the lower part to a depth of 60 inches or more is light brownish gray clay loam.

Permeability is moderately slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 27 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high. This soil is calcareous throughout.

These soils are used as rangeland and for nonirrigated farming. The main nonirrigated crops are wheat, oats, and barley.

Cropland.—These soils are suited to nonirrigated crops. They are limited mainly by the hazards of water erosion and soil blowing. Minimum tillage, contour cultivation, stripcropping, tall grass barriers, grassed waterways, and return of crop residue to the soil reduce soil blowing and water erosion. Tall grass barriers also reduce evaporation and trap snow, which increases the amount of moisture in the soil. Return of crop residue also helps to maintain good soil tilth. Chiseling stubble fields in fall on the contour or across the slope reduces runoff and water erosion.

Rangeland.—The potential native plant community on these soils is mainly western wheatgrass, little bluestem, bluebunch wheatgrass, plains muhly, winterfat, and sideoats grama. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, perennial short grasses, fringed sagewort, and perennial forbs increases. If excessive grazing continues, plants such as annuals, weedlike forbs, and clubmoss may invade. The potential native plant community produces about 1,600 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,000 pounds in years of below-normal precipitation.

The surface layer of these soils is susceptible to water erosion and soil blowing if it is disturbed or the range is overgrazed. Proper grazing use insures good plant vigor and adequate plant cover. Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Where clubmoss and blue grama are the dominant vegetation, practices such as scalping or shallow chiseling can be used to improve the rangeland. Such practices increase water infiltration, reduce plant competition, and allow the more desirable native plants to increase. Conducting fieldwork on the contour or across the slope, where practical, reduces erosion and conserves moisture.

Windbreaks.—The Vida soil is suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian elm, white willow, golden willow, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, skunkbush sumac, and silver buffaloberry.

The Zahill soil is suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian elm, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, and skunkbush sumac.

Homesite development.—These soils are poorly suited to homesite development. They are limited mainly by moderately slow permeability, low soil strength, and shrink-swell potential. In the construction of basements or foundations for dwellings, the limitation of shrink-swell potential can be overcome by backfilling with suitable material that has low shrink-swell potential. If these soils are used for septic tank absorption fields, use of gravel backfill in the absorption line trench, excavated to a suitable depth, helps to compensate for the limitation of moderately slow permeability. Slope is a concern in installing septic tank absorption fields. Absorption lines should be installed on the contour. Shrinking and swelling and low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. Access roads must be designed to control surface runoff and help stabilize cut slopes.

This map unit is in capability subclass IVe, nonirrigated. It is in Silty range site, 10- to 14-inch precipitation zone.

153—Wabek sandy loam, 4 to 15 percent slopes. This deep, excessively drained soil is on fans, terraces, and terrace edges throughout the county. It formed in sandy and gravelly outwash deposits. Slopes are mainly less than 250 feet long. Elevation is 1,900 to 3,400 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Telstad, Evanston, Lehr, Cambert, and Vida soils. These areas do not adversely affect the use and management of this unit as rangeland.

Typically, this Wabek soil has a surface layer of grayish brown sandy loam 7 inches thick. The underlying material to a depth of 60 inches or more is light gray very gravelly sand. Very gravelly sand is at a depth of 7 to 15 inches.

Permeability is very rapid, and available water capacity is very low. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 34 inches. Runoff is slow, and the hazard of water erosion is medium. The hazard of soil blowing is high. This soil is calcareous below a depth of about 7 inches. It is very droughty.

This soil is used as rangeland. It is very poorly suited to cultivated crops because it is very droughty.

Rangeland.—The potential native plant community is mainly bluebunch wheatgrass, plains muhly, little bluestem, and needleandthread. If the range is excessively grazed, the proportion of bluebunch wheatgrass, plains muhly, and little bluestem decreases and the proportion of needleandthread, threadleaf sedge, blue grama, green sagewort, and yucca increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 700 pounds per acre of air-dry vegetation in years of above-normal precipitation and 400 pounds in years of below-normal precipitation.

This soil is very poorly suited to mechanical treatment or seeding because it is very droughty.

Windbreaks.—This soil is not suited to windbreaks. It is limited mainly by the very low available water capacity.

Homesite development.—This soil is suited to homesite development. It has few limitations. Slope is a concern in installing septic tank absorption fields. Absorption lines should be installed on the contour. If this soil is used for septic tank absorption fields, the very rapid permeability can cause pollution of ground water. The soil is a suitable source of gravel for building and surfacing roads.

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

154—Wabek sandy loam, 15 to 45 percent slopes. This deep, excessively drained soil is on terrace edges in the northern part of the county. It formed in sandy and gravelly outwash deposits. Slopes are mainly less than 250 feet long. Elevation is 1,900 to 3,400 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Telstad, Hillon, Vida, Cabba, and Zahill soils. These areas do not adversely affect the use and management of this unit as rangeland.

Typically, this Wabek soil has a surface layer of grayish brown sandy loam 7 inches thick. The underlying material to a depth of 60 inches or more is light gray very gravelly sand. Very gravelly sand is at a depth of 7 to 15 inches.

Permeability is very rapid, and available water capacity is very low. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 34 inches. Runoff is slow, and the hazard of water erosion is medium. The hazard of soil blowing is high. This soil is calcareous below a depth of about 7 inches. It is very droughty.

This soil is used as rangeland.

Cropland.—This soil is not suited to cultivated crops because of steepness of slope.

Rangeland.—The potential native plant community is mainly bluebunch wheatgrass, plains muhly, little bluestem, and needleandthread. If the range is excessively grazed, the proportion of bluebunch wheatgrass, plains muhly, and little bluestem decreases and the proportion of needleandthread, threadleaf sedge, blue grama, green sagewort, and yucca increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 700 pounds per acre of air-dry vegetation in years of above-normal precipitation and 400 pounds in years of below-normal precipitation.

This soil is not suited to mechanical treatment or seeding because of the steepness of slope and droughtiness.

Windbreaks.—This soil is not suited to windbreaks. It is limited mainly by the steepness of slope and the very low available water capacity.

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

This map unit is in capability subclass VIIe, nonirrigated. It is in Gravel range site, 10- to 14-inch precipitation zone.

155—Weingart clay, 2 to 8 percent slopes. This moderately deep, well drained, strongly salt- and sodium-affected soil is on foot slopes and lower side slopes in the west-central and northeastern parts of the county. It formed in material derived from semiconsolidated shale. Slopes are mainly less than 1,000 feet long. Elevation is 1,900 to 2,600 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Zahill, Absher, Gerdrum, and Yawdim soils and shale outcroppings. These areas do not adversely affect the use and management of this unit as rangeland.

Typically, this Weingart soil, where mixed to a depth of 7 inches, has a surface layer of grayish brown clay. The upper 2 inches of the subsoil is grayish brown clay, and the lower 12 inches is olive gray silty clay. The substratum to a depth of 30 inches is light olive gray silty clay loam. Below this to a depth of 60 inches or more is light olive gray semiconsolidated shale. Semiconsolidated shale is at a depth of 20 to 40 inches.

Permeability is very slow, and available water capacity is low. Effective rooting depth is limited by the semiconsolidated shale at a depth of 20 to 40 inches. Where this soil is under native vegetation, the average annual wetting depth is 20 to 24 inches. Runoff is slow to medium, and the hazard of water erosion is slight to moderate. The hazard of soil blowing is moderate. This soil is strongly salt- and sodium-affected at a depth of about 1 inch. It is droughty.

This soil is used as rangeland.

Cropland.—This soil is very poorly suited to cultivated crops because it is droughty; has semiconsolidated shale at a depth of 20 to 40 inches, which limits rooting depth; and has a high content of salts and sodium in the subsoil, which reduces root and moisture penetration. These characteristics limit crop yields.

Rangeland.—The potential native plant community is mainly western wheatgrass, green needlegrass, Montana wheatgrass, winterfat, and Nuttall saltbush. If the range is excessively grazed, the proportion of these plants decreases and the proportion of blue grama, Sandberg bluegrass, perennial forbs, other perennial short grasses, and big sagebrush increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,000 pounds per acre of air-dry vegetation in years of above-normal precipitation and 600 pounds in years of below-normal precipitation.

This soil is very poorly suited to seeding because of the high content of salts and sodium.

Windbreaks.—This soil is not suited to windbreaks. It is limited mainly by the clayey texture and the high content of salts and sodium.

Homesite development.—This soil is poorly suited to homesite development. It is limited mainly by very slow permeability, moderate depth to semiconsolidated shale, low soil strength, and shrink-swell potential. In the construction of basements or foundations for dwellings, the limitation of shrink-swell potential can be overcome by backfilling with suitable material that has low shrink-swell potential. This soil is poorly suited to septic tank absorption fields because of the very slow permeability and moderate depth to semiconsolidated shale. Shrinking and swelling and low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations.

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

156—Williams loam, 0 to 2 percent slopes. This deep, well drained soil is on upland benches and in swales in the northeastern part of the county. It formed in glacial till. Slopes are mainly 250 feet to more than 1,000 feet long. Elevation is 2,000 to 2,500 feet. The average annual precipitation is about 15 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Bowbells, Vida, Thoeny, and Zahill soils. The salt- and sodium-affected Thoeny soils are in shallow depressional areas. The salts and sodium reduce the availability of moisture and plant nutrients and thus limit crop yields. The Zahill soils are on the tops of knolls and low hills. They are highly susceptible to soil blowing. The Bowbells and Vida soils do not adversely affect the use and management of this unit as rangeland and for nonirrigated farming.

Typically, this Williams soil has a surface layer of dark grayish brown loam 8 inches thick. The upper 7 inches of the subsoil is dark grayish brown clay loam, and the lower 8 inches is brown clay loam. The substratum to a depth of 60 inches or more is light gray and light olive gray clay loam.

Permeability is moderately slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 30 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

Most areas of this soil are used for nonirrigated farming. A few areas are used as rangeland. The main nonirrigated crops are wheat, oats, and barley. If this soil is irrigated, it is prime farmland.

Cropland.—This soil is well suited to nonirrigated crops. It is limited mainly by the hazard of soil blowing. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, and stubble mulch tillage reduce soil blowing.

Rangeland.—The potential native plant community is mainly bluebunch wheatgrass, little bluestem, green needlegrass, plains muhly, western wheatgrass, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, perennial short grasses, fringed sagewort, and perennial forbs increases. If excessive grazing continues, plants such as annuals, weedlike forbs, and clubmoss may invade. The potential native plant community produces about 2,000 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,200 pounds in years of below-normal precipitation.

Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Where clubmoss and blue grama are the dominant vegetation, practices such as scalping or shallow chiseling can be used to improve the rangeland. Such practices increase water infiltration, reduce plant competition, and allow the more desirable native plants to increase.

Windbreaks.—This soil is well suited to windbreaks. Suitable trees for planting are Russian-olive, white willow, golden willow, Siberian elm, Siberian crabapple, black hawthorn, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and western sandcherry.

Homesite development.—This soil is suited to homesite development. It is limited mainly by moderately slow permeability and shrink-swell potential. In the construction of basements or foundations for dwellings, the limitation of shrink-swell potential can be overcome by backfilling with suitable material that has low shrink-swell potential. If this soil is used for septic tank absorption fields, the limitation of moderately slow permeability can be overcome by increasing the size of the absorption field or by excavating the trench to a suitable depth. The field or trench should be backfilled with gravel.

This map unit is in capability subclass IIIe, nonirrigated. It is in Silty range site, 10- to 14-inch precipitation zone.

157—Williams loam, 2 to 4 percent slopes. This deep, well drained soil is on upland benches of undulating glaciated uplands in the northeastern part of the county. It formed in glacial till. Slopes are mainly 250 to 1,000 feet long. Elevation is 2,000 to 2,500 feet. The average annual precipitation is about 15 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Bowbells, Vida, Thoeny, and Zahill soils. The Zahill soils are on the tops of low hills and knolls. They are highly susceptible to soil blowing. The salt- and sodium-affected Thoeny soils are in shallow depressional areas. The salts and sodium reduce the availability of moisture and plant nutrients and thus limit crop yields. The Bowbells and Vida soils do not adversely affect the use and management of this unit for nonirrigated farming and as rangeland.

Typically, this Williams soil has a surface layer of dark grayish brown loam 8 inches thick. The upper 7 inches of the subsoil is dark grayish brown clay loam, and the lower 8 inches is brown clay loam. The substratum to a depth of 60 inches or more is light gray and light olive gray clay loam.

Permeability is moderately slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 30 inches. Runoff is slow, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

Most areas of this soil are used for nonirrigated farming. A few areas are used as rangeland. The main nonirrigated crops are wheat, oats, and barley. If this soil is irrigated, it is prime farmland.

Cropland.—This soil is well suited to nonirrigated crops. It is limited mainly by the hazards of soil blowing and water erosion and by the potential for formation of saline seeps. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, stubble mulch tillage, and grassed waterways reduce soil blowing and water erosion.

In the area north and east of Vida, especially in the vicinity of Montana Highway 201 and in the Wolf Creek drainageway, this soil is susceptible to formation of saline seeps. Suitable practices for reducing the development of saline seeps are using flexible cropping systems, seeding legumes in recharge areas, and providing surface and subsurface drainage where needed.

Rangeland.—The potential native plant community is mainly bluebunch wheatgrass, little bluestem, green needlegrass, plains muhly, western wheatgrass, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, perennial short grasses, fringed sagewort, and perennial forbs increases. If excessive grazing continues, plants such as annuals, weedlike forbs, and clubmoss may invade. The potential native plant community produces about 2,000 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,200 pounds in years of below-normal precipitation.

The surface layer is susceptible to water erosion and soil blowing if it is disturbed or the range is overgrazed. Proper grazing use insures good plant vigor and adequate plant cover. Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Where clubmoss and blue grama are the dominant vegetation, practices such as scalping or shallow chiseling can be used to improve the rangeland. Such practices increase water infiltration, reduce plant competition, and allow the more desirable native plants to increase.

Windbreaks.—This soil is well suited to windbreaks. Suitable trees for planting are Russian-olive, white willow, golden willow, Siberian elm, Siberian crabapple, black hawthorn, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and western sandcherry.

Homesite development.—This soil is suited to homesite development. It is limited mainly by moderately slow permeability and shrink-swell potential. In the construction of basements or foundations for dwellings, the limitation of shrink-swell potential can be overcome by backfilling with suitable material that has low shrink-swell potential. If this soil is used for septic tank absorption fields, the limitation of moderately slow permeability can be overcome by increasing the size of the absorption field or by excavating the trench to a suitable depth. The field or trench should be backfilled with gravel.

This map unit is in capability subclass IIIe, nonirrigated. It is in Silty range site, 10- to 14-inch precipitation zone.

158—Williams-Vida complex, 2 to 4 percent slopes. This map unit is on undulating glaciated uplands in the northeastern part of the county. Slopes are mainly less than 1,000 feet long. Elevation is 2,000 to 2,500 feet. The average annual precipitation is about 15 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

This unit is about 50 percent Williams loam and 40 percent Vida clay loam. The Williams soil is in swales and on lower side slopes, and the Vida soil is on the tops of knolls and low hills.

Included in this unit are small areas of Bowbells, Thoeny, and Zahill soils. Included areas make up about 10 percent of the total acreage. The Zahill soils are on the tops of low hills and knolls. They are highly susceptible to soil blowing. The salt- and sodium-affected Thoeny soils are in shallow depressional areas on fans and foot slopes. The salts and sodium reduce the availability of moisture and plant nutrients and thus limit crop yields. The Bowbells soils do not adversely affect the use and management of this unit for nonirrigated farming and as rangeland.

The Williams soil is deep and well drained. It formed in glacial till. Typically, the surface layer is dark grayish brown loam 8 inches thick. The upper 7 inches of the subsoil is dark grayish brown clay loam, and the lower 8 inches is brown clay loam. The substratum to a depth of 60 inches or more is light gray and light olive gray clay loam.

Permeability is moderately slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 30 inches. Runoff is slow, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

The Vida soil is deep and well drained. It formed in glacial till. Typically, the surface layer, where mixed to a depth of 7 inches, is brown clay loam. The upper 2 inches of the subsoil is brown clay loam, and the lower 10 inches is light brownish gray loam. The substratum to a depth of 60 inches or more is light gray clay loam.

Permeability is moderately slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 30 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate. This soil is calcareous below a depth of about 9 inches.

Most areas of these soils are used for nonirrigated farming. A few areas are used as rangeland. The main nonirrigated crops are wheat, oats, and barley. If these soils are irrigated, they are prime farmland.

Cropland.—These soils are well suited to nonirrigated crops. They are limited mainly by the moderate hazards of soil blowing and water erosion and by the potential for formation of saline seeps. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, stubble mulch tillage, and grassed waterways reduce soil blowing and water erosion.

In the area north and east of Vida, especially in the vicinity of Montana Highway 201 and in the Wolf Creek drainageway, these soils are susceptible to formation of saline seeps. Suitable practices for reducing the development of saline seeps are using flexible cropping systems, seeding legumes in recharge areas, and providing surface and subsurface drainage where needed.

Rangeland.—The potential native plant community is mainly bluebunch wheatgrass, little bluestem, western wheatgrass, green needlegrass, plains muhly, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, perennial short grasses, fringed sagewort, and perennial forbs increases. If excessive grazing continues, plants such as annuals, weedlike forbs, and clubmoss may invade. The potential native plant community on the Williams soil produces about 2,000 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,200 pounds in years of below-normal precipitation. The potential native plant community on the Vida soil produces about 1,800 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,200 pounds in years of below-normal precipitation.

The surface layer of these soils is susceptible to water erosion and soil blowing if it is disturbed or the range is overgrazed. Proper grazing use insures good plant vigor and adequate plant cover. Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Where clubmoss and blue grama are the dominant vegetation, practices such as scalping or shallow chiseling can be used to improve the rangeland. Such practices increase water infiltration, reduce plant competition, and allow the more desirable native plants to increase.

Windbreaks.—The Williams soil is well suited to windbreaks. Suitable trees for planting are Russian-olive, white willow, golden willow, Siberian elm, Siberian crabapple, black hawthorn, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and western sandcherry.

The Vida soil is well suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian elm, white willow, golden willow, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, skunkbush sumac, and silver buffaloberry.

Homesite development.—These soils are poorly suited to homesite development. They are limited mainly by moderately slow permeability, low soil strength, and shrink-swell potential. In the construction of basements or foundations for dwellings, the limitation of shrink-swell potential can be overcome by backfilling with suitable material that has low shrink-swell potential. If these soils are used for septic tank absorption fields, the limitation of moderately slow permeability can be overcome by increasing the size of the absorption field or by excavating the trench to a suitable depth. The field or trench should be backfilled with gravel. Shrinking and swelling and low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations.

This map unit is in capability subclass IIIe, nonirrigated. It is in Silty range site, 10- to 14-inch precipitation zone.

159—Yamac loam, 0 to 4 percent slopes. This deep, well drained soil is on terraces, fans, and foot slopes in the western part of the county. It formed in alluvium. Slopes are mainly 250 feet to more than 1,000 feet long. Elevation is 1,900 to 2,600 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Cambeth, Kremlin, Chinook, and Twilight soils. The moderately deep, well drained Twilight soils are on the upper side slopes and tops of knolls. They are droughty and are low in productivity. The Cambeth, Kremlin, and Chinook soils do not adversely affect the use and management of this unit as rangeland and for nonirrigated farming.

Typically, this Yamac soil has a surface layer of grayish brown loam 4 inches thick. The upper 7 inches of the subsoil is olive loam, and the lower 8 inches is grayish brown loam. The substratum to a depth of 60 inches or more is pale olive loam.

Permeability is moderate, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 24 inches. Runoff is slow to medium, and the hazard of water erosion is slight to moderate. The hazard of soil blowing is moderate. The soil is calcareous below a depth of 11 inches.

This soil is used mainly as rangeland. It is also used for nonirrigated farming. The main nonirrigated crops are wheat, oats, and barley.

Cropland.—This soil is well suited to nonirrigated crops. It is limited mainly by the hazard of soil blowing. The surface layer of the soil is low in organic matter content. Using green manure crops, barnyard manure, and crop residue increases the organic matter content and fertility of the soil. Crops respond well to the application of phosphorus and nitrogen. Stripcropping,

tall grass barriers, field windbreaks, minimum tillage, and stubble mulch tillage reduce soil blowing.

Rangeland.—The potential native plant community is mainly western wheatgrass, green needlegrass, bluebunch wheatgrass, little bluestem, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, perennial short grasses, threadleaf sedge, fringed sagewort, silver sagebrush, and perennial forbs increases. If excessive grazing continues, plants such as annuals, weedlike forbs, and Kentucky bluegrass may invade. The potential native plant community produces about 1,600 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,000 pounds in years of below-normal precipitation.

Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Areas of deteriorated rangeland can be improved by mechanical treatment practices such as shallow chiseling and scalping.

Windbreaks.—This soil is suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian elm, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, and skunkbush sumac.

Homesite development.—This soil is suited to homesite development. It is limited mainly by moderate permeability and low soil strength. If this soil is used for septic tank absorption fields, use of gravel backfill in the absorption line trench, excavated to a suitable depth, helps to compensate for the limitation of moderate permeability. Low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome this limitation. In places, excavation for roads can expose material that is highly susceptible to soil blowing.

This map unit is in capability subclass IIIe, nonirrigated. It is in Silty range site, 10- to 14-inch precipitation zone.

160—Yamac loam, 4 to 8 percent slopes. This deep, well drained soil is on fans and foot slopes of low hills in the western part of the county. It formed in alluvium. Slopes are mainly 250 feet to more than 1,000 feet long. Elevation is 1,900 to 2,600 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Cambeth, Twilight, Chinook, and Rominell soils. The strongly salt- and sodium-affected Rominell soils are on fans and foot slopes. The high content of salts reduces the amount of water available to plants, and the high content of sodium reduces the penetration of roots and moisture. These characteristics limit crop yields. The moderately deep, well drained Twilight soils are on the upper side slopes and tops of hills and ridges. They are droughty and are low in productivity. The Cambeth and Chinook soils do not adversely affect the use and management of this unit as rangeland and for nonirrigated farming.

Typically, this Yamac soil has a surface layer of grayish brown loam 4 inches thick. The upper 7 inches of the subsoil is olive loam, and the lower 8 inches is grayish brown loam. The substratum to a depth of 60 inches or more is pale olive loam.

Permeability is moderate, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 24 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate. The soil is calcareous below a depth of 11 inches.

This soil is used mainly as rangeland. It is also used for nonirrigated farming. The main nonirrigated crops are wheat, oats, and barley.

Cropland.—This soil is well suited to nonirrigated crops. It is limited mainly by the hazards of soil blowing and water erosion. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, stubble mulch tillage, and grassed waterways reduce soil blowing and water erosion. The surface layer of this soil is low in organic matter content. Using green manure crops, barnyard manure, and crop residue increases the organic matter content and fertility of the soil. Crops respond well to the application of phosphorus and nitrogen.

Rangeland.—The potential native plant community is mainly western wheatgrass, green needlegrass, little bluestem, bluebunch wheatgrass, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, perennial short grasses, threadleaf sedge, and fringed sagewort increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,800 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,200 pounds in years of below-normal precipitation.

The surface layer is susceptible to water erosion and soil blowing if it is disturbed or the range is overgrazed. Proper grazing use insures good plant vigor and adequate plant cover. Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Areas of deteriorated rangeland can be improved by mechanical treatment practices such as shallow chiseling and scalping. Conducting fieldwork on the contour or across the slope, where practical, reduces erosion and conserves moisture.

Windbreaks.—This soil is suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian elm, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, and skunkbush sumac.

Homesite development.—This soil is suited to homesite development. It is limited mainly by moderate

permeability and low soil strength. Low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome this limitation. In places, excavation for roads can expose material that is highly susceptible to soil blowing. If the soil is used for septic tank absorption fields, use of gravel backfill in the absorption line trench, excavated to a suitable depth, helps to compensate for the limitation of moderate permeability.

This map unit is in capability subclass IIIe, nonirrigated. It is in Silty range site, 10- to 14-inch precipitation zone.

161—Yamac loam, 8 to 15 percent slopes. This deep, well drained soil is on the sides of hills and ridges in the western part of the county. It formed in alluvium. Slopes are mainly less than 1,000 feet long. Elevation is 1,900 to 2,600 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Cabbart, Fleak, Twilight, and Rominell soils. Also included are small areas of sandstone outcroppings. The shallow Cabbart and Fleak soils and the moderately deep Twilight soils are on the upper side slopes and tops of hills and ridges. They are droughty and are low in productivity. The strongly salt- and sodium-affected Rominell soils are on fans and foot slopes. The high content of salts decreases the amount of water available to plants, and the high content of sodium reduces the penetration of roots and moisture. These characteristics limit crop yields.

Typically, this Yamac soil has a surface layer of grayish brown loam 4 inches thick. The upper 7 inches of the subsoil is olive loam, and the lower 8 inches is grayish brown loam. The substratum to a depth of 60 inches or more is pale olive loam.

Permeability is moderate, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 24 inches. Runoff is medium, and the hazard of water erosion is high. The hazard of soil blowing is moderate. The soil is calcareous below a depth of 4 inches.

Most areas of this soil are used as rangeland. A few areas are used for nonirrigated farming. The main nonirrigated crops are wheat, oats, and barley.

Cropland.—This soil is suited to nonirrigated crops. It is limited mainly by the hazards of soil blowing and water erosion. Minimum tillage, contour cultivation, stripcropping, tall grass barriers, grassed waterways, and return of crop residue to the soil reduce soil blowing and water erosion. Tall grass barriers also reduce evaporation and trap snow, which increases the amount of moisture in the soil. Return of crop residue also helps to maintain good soil tilth. Chiseling stubble fields in fall on the contour or across the slope reduces runoff and water erosion. The surface layer of this soil is low in organic matter content. Using green manure crops, barnyard manure, and crop residue increases the organic matter content and fertility of the soil. Crops respond well to the application of phosphorus and nitrogen.

Rangeland.—The potential native plant community is mainly western wheatgrass, green needlegrass, little bluestem, bluebunch wheatgrass, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, perennial short grasses, threadleaf sedge, and fringed sagewort increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,600 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,000 pounds in years of below-normal precipitation.

The surface layer is susceptible to water erosion and soil blowing if it is disturbed or the range is overgrazed. Proper grazing use insures good plant vigor and adequate plant cover. Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Areas of deteriorated rangeland can be improved by mechanical treatment practices such as shallow chiseling and scalping. Conducting fieldwork on the contour or across the slope, where practical, reduces erosion and conserves moisture.

Windbreaks.—This soil is suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian elm, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, and skunkbush sumac.

Homesite development.—This soil is suited to homesite development. It is limited mainly by moderate permeability and low soil strength. In places, excavation for roads can expose material that is highly susceptible to soil blowing. Slope is a concern in installing septic tank absorption fields. Absorption lines should be installed on the contour. Use of gravel backfill in the absorption line trench, excavated to a suitable depth, helps to compensate for the limitation of moderate permeability.

This map unit is in capability subclass IVe, nonirrigated. It is in Silty range site, 10- to 14-inch precipitation zone.

162—Yamac-Twilight complex, 2 to 8 percent slopes. This map unit is on uplands in the western part of the county. Slopes are mainly 250 to 1,000 feet long. Elevation is 1,900 to 2,600 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

This unit is about 50 percent Yamac loam and 30 percent Twilight fine sandy loam. The Yamac soil is on the lower side slopes of hills and ridges, on fans, and in

swales. The Twilight soil is on the upper side slopes and tops of hills and ridges.

Included in this unit are small areas of Fleak, Cabbart, Busby, and Kremlin soils. Included areas make up about 20 percent of the total acreage. The shallow, well drained Cabbart soils and the shallow, somewhat excessively drained Fleak soils are on the tops of knolls and low hills. These soils are droughty and are low in productivity. The Busby and Kremlin soils do not adversely affect the use and management of this unit as rangeland and for nonirrigated farming.

The Yamac soil is deep and well drained. It formed in alluvium. Typically, the surface layer is grayish brown loam 4 inches thick. The upper 7 inches of the subsoil is olive loam, and the lower 8 inches is grayish brown loam. The substratum to a depth of 60 inches or more is pale olive loam.

Permeability is moderate, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 24 inches. Runoff is slow to medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate. This soil is calcareous below a depth of 4 inches.

The Twilight soil is moderately deep and well drained. It formed in material derived from weakly consolidated, sandy sedimentary beds. Typically, the surface layer is brown fine sandy loam 5 inches thick. The upper 5 inches of the subsoil is brown fine sandy loam, and the lower 6 inches is pale brown fine sandy loam. The substratum to a depth of 25 inches is light brownish gray sandy loam. Below this to a depth of 60 inches or more are light brownish gray, weakly consolidated, sandy sedimentary beds. Sedimentary beds are at a depth of 20 to 40 inches.

Permeability is moderately rapid, and available water capacity is low. Effective rooting depth is limited by the sedimentary beds at a depth of 20 to 40 inches. Where this soil is under native vegetation, the average annual wetting depth is 20 to 30 inches. Runoff is slow, and the hazard of water erosion is slight to moderate. The hazard of soil blowing is high. This soil is droughty.

Most areas of these soils are used as rangeland. A few areas are used for nonirrigated farming. The main nonirrigated crops are wheat, oats, and barley.

Cropland.—If these soils are used for nonirrigated crops, they are limited by the hazard of soil blowing and the low available water capacity of the Twilight soil. Minimum tillage, contour cultivation, stripcropping, tall grass barriers, grassed waterways, and return of crop residue to the soil reduce soil blowing and water erosion. Tall grass barriers also reduce evaporation and trap snow, which increases the amount of moisture in the soil. Return of crop residue also helps to maintain good soil tilth. Chiseling stubble fields in fall on the contour or across the slope reduces runoff and water erosion. Crops respond to nitrogen and phosphorus fertilizer.

Rangeland.—The potential native plant community on the Yamac soil is mainly western wheatgrass, green needlegrass, little bluestem, bluebunch wheatgrass, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, perennial short grasses, threadleaf sedge, and fringed sagewort increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,800 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,200 pounds in years of below-normal precipitation.

The potential native plant community on the Twilight soil is mainly prairie sandreed, little bluestem, needleandthread, and thickspike wheatgrass. If the range is excessively grazed, the proportion of prairie sandreed and little bluestem decreases and the proportion of needleandthread, thickspike wheatgrass, perennial short grasses, threadleaf sedge, and perennial forbs increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,800 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,000 pounds in years of below-normal precipitation.

The surface layer of these soils is susceptible to water erosion and soil blowing if it is disturbed or the range is overgrazed. Proper grazing use insures good plant vigor and adequate plant cover. Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Areas of deteriorated rangeland can be improved by mechanical treatment practices such as shallow chiseling and scalping. Conducting fieldwork on the contour or across the slope, where practical, reduces erosion and conserves moisture.

Windbreaks.—The Yamac soil is suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian elm, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, and skunkbush sumac.

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

Homesite development.—These soils are suited to homesite development. The Yamac soil is limited mainly by moderate permeability and low soil strength. If this soil is used for septic tank absorption fields, use of gravel backfill in the absorption line trench, excavated to a suitable depth, helps to compensate for the limitation of moderate permeability. In places, excavation for roads can expose material that is highly susceptible to soil blowing. Low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate

drainage and the use of suitable fill material that is properly compacted can overcome this limitation.

The Twilight soil has few limitations for homesite development.

This map unit is in capability subclass IVe, nonirrigated. The Yamac soil is in Silty range site, 10- to 14-inch precipitation zone, and the Twilight soil is in Sandy range site, 10- to 14-inch precipitation zone.

163—Yamac-Twilight-Fleak complex, 8 to 15 percent slopes. This map unit is on uplands in the western part of the county. Slopes are mainly less than 1,000 feet long. Elevation is 1,900 to 2,600 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

This unit is about 35 percent Yamac loam, 30 percent Twilight fine sandy loam, and 20 percent Fleak loamy sand. The Yamac soil is on fans and lower side slopes, the Twilight soil is on the upper side slopes and tops of hills and ridges, and the Fleak soil is on the tops of hills and ridges.

Included in this unit are small areas of Cabbart, Busby, and Rominell soils. Also included are small areas of sandstone outcroppings. Included areas make up about 15 percent of the total acreage. The shallow, well drained Cabbart soils are on the tops of hills and ridges. They are droughty and are low in productivity. The strongly salt- and sodium-affected Rominell soils are on fans and in swales. The high content of salts and sodium reduces the water available to plants and reduces the penetration of roots and moisture. These characteristics limit crop yields. The areas of sandstone outcroppings are on ridgetops and can be farmed around. The Busby soils do not adversely affect the use and management of this unit as rangeland.

The Yamac soil is deep and well drained. It formed in alluvium. Typically, the surface layer is grayish brown loam 4 inches thick. The upper 7 inches of the subsoil is olive loam, and the lower 8 inches is grayish brown loam. The substratum to a depth of 60 inches or more is pale olive loam.

Permeability is moderate, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 21 inches. Runoff is medium, and the hazard of water erosion is high. The hazard of soil blowing is moderate. This soil is calcareous below a depth of 4 inches.

The Twilight soil is moderately deep and well drained. It formed in material derived from weakly consolidated, sandy sedimentary beds. Typically, the surface layer is brown fine sandy loam 5 inches thick. The upper 5 inches of the subsoil is brown fine sandy loam, and the lower 6 inches is pale brown fine sandy loam. The substratum to a depth of 25 inches is light brownish gray sandy loam. Below this to a depth of 60 inches or more are light brownish gray, weakly consolidated, sandy sedimentary beds. Sedimentary beds are at a depth of 20 to 40 inches.

Permeability is moderately rapid, and available water capacity is low. Effective rooting depth is limited by the sedimentary beds at a depth of 20 to 40 inches. Where this soil is under native vegetation, the average annual wetting depth is 20 to 30 inches. The hazard of soil blowing is high. This soil is droughty.

The Fleak soil is shallow and somewhat excessively drained. It formed in weakly consolidated, sandy sedimentary beds. Typically, the surface layer, where mixed to a depth of 7 inches, is olive brown loamy sand. The underlying material to a depth of 16 inches is olive loamy sand. Below this to a depth of 60 inches or more are mostly light olive brown, weakly consolidated, sandy sedimentary beds. Sedimentary beds are at a depth of 10 to 20 inches.

Permeability is rapid, and available water capacity is very low. Effective rooting depth is limited by the sedimentary beds at a depth of 10 to 20 inches. Where this soil is under native vegetation, the average annual wetting depth is 10 to 20 inches. Runoff is slow to medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high. This soil is droughty.

These soils are used mainly as rangeland.

Cropland.—These soils are poorly suited to cultivated crops because of the restricted available water capacity of the Twilight and Fleak soils and the hazard of soil blowing.

Rangeland.—The potential native plant community on the Yamac soil is mainly western wheatgrass, green needlegrass, little bluestem, bluebunch wheatgrass, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, perennial short grasses, threadleaf sedge, and fringed sagewort increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,600 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,000 pounds in years of below-normal precipitation.

The potential native plant community on the Twilight soil is mainly prairie sandreed, little bluestem, needleandthread, and thickspike wheatgrass. If the range is excessively grazed, the proportion of prairie sandreed and little bluestem decreases and the proportion of needleandthread, thickspike wheatgrass, perennial short grasses, threadleaf sedge, and perennial forbs increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,800 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,000 pounds in years of below-normal precipitation.

The potential native plant community on the Fleak soil is mainly prairie sandreed, little bluestem, plains muhly,

and needleandthread. If the range is excessively grazed, the proportion of prairie sandreed, little bluestem, and plains muhly decreases and the proportion of needleandthread, perennial short grasses, threadleaf sedge, yucca, and perennial forbs increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,200 pounds per acre of air-dry vegetation in years of above-normal precipitation and 700 pounds in years of below-normal precipitation.

Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice on these soils. Conducting fieldwork on the contour or across the slope, where practical, reduces erosion and conserves moisture. The Twilight and Fleak soils are poorly suited to practices such as shallow chiseling and scalping because they are droughty and are susceptible to soil blowing and water erosion if they are disturbed.

Windbreaks.—The Yamac soil is suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian elm, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, and skunkbush sumac.

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

The Fleak soil is not suited to windbreaks. It is limited mainly by the very low available water capacity.

Homesite development.—These soils are suited to homesite development. The Yamac soil is limited mainly by moderate permeability and low soil strength. If this soil is used for septic tank absorption fields, use of gravel backfill in the absorption line trench, excavated to a suitable depth, helps to compensate for the limitation of moderate permeability. In places, excavation for roads can expose material that is highly susceptible to soil blowing. Low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome this limitation.

The Twilight and Fleak soils have few limitations for homesite development. In places, excavation for roads can expose material that is highly susceptible to soil blowing. Slope is a concern in installing septic tank absorption fields. Absorption lines should be installed on the contour.

This map unit is in capability subclass IVe, nonirrigated. The Yamac soil is in Silty range site, 10- to 14-inch precipitation zone; the Twilight soil is in Sandy range site, 10- to 14-inch precipitation zone; and the Fleak soil is in Shallow range site, 10- to 14-inch precipitation zone.

164—Yawdim silty clay, 2 to 8 percent slopes. This shallow, well drained soil is on the tops and sides of knolls and low hills in the western part of the county. It formed in material derived from semiconsolidated shale. Slopes are mainly less than 1,000 feet long. Elevation is 1,900 to 2,600 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Yamac, Gerdrum, Weingart, and Busby soils. Also included are small areas of Yawdim soils that have slopes of more than 8 percent. These areas do not adversely affect the use and management of this unit as rangeland.

Typically, this Yawdim soil has a surface layer of grayish brown silty clay 6 inches thick. The underlying material to a depth of 15 inches is light olive gray silty clay. Below this to a depth of 60 inches or more is light olive gray semiconsolidated shale. Semiconsolidated shale is at a depth of 10 to 20 inches.

Permeability is slow, and available water capacity is very low. Effective rooting depth is limited by the semiconsolidated shale at a depth of 10 to 20 inches. Where this soil is under native vegetation, the average annual wetting depth is 10 to 20 inches. Runoff is slow to medium, and the hazard of water erosion is slight to moderate. The hazard of soil blowing is high. The soil is droughty.

This soil is used as rangeland.

Cropland.—This soil is very poorly suited to cultivated crops because of the very low available water capacity and the root-limiting semiconsolidated shale at a depth of 10 to 20 inches.

Rangeland.—The potential native plant community is mainly western wheatgrass, green needlegrass, thickspike wheatgrass, and Nuttall saltbush. If the range is excessively grazed, the proportion of these plants decreases and the proportion of Sandberg bluegrass, blue grama, big sagebrush, perennial forbs, and rabbitbrush increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,100 pounds per acre of air-dry vegetation in years of above-normal precipitation and 700 pounds in years of below-normal precipitation.

This soil is very poorly suited to mechanical treatment practices. The surface layer is susceptible to water erosion and soil blowing if it is disturbed or the range is overgrazed. Proper grazing use insures good plant vigor and adequate plant cover.

Windbreaks.—This soil is not suited to windbreaks. It is limited mainly by the very low available water capacity.

Homesite development.—This soil is poorly suited to homesite development. It is limited mainly by shallow depth to semiconsolidated shale, shrink-swell potential, slow permeability, and low soil strength. In the construction of basements or foundations for dwellings,

the limitation of shrink-swell potential can be overcome by backfilling with suitable material that has low shrink-swell potential. The soil is poorly suited to septic tank absorption fields because of the slow permeability and shallow depth to semiconsolidated shale. Shrinking and swelling, low soil strength, and shallow depth to semiconsolidated shale can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations.

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

165—Yawdim-Badland-Cabbart association. This map unit is on uplands in the west-central part of the county. Slope is 15 to 45 percent. Slopes are mainly less than 250 feet long. Elevation is 1,900 to 2,600 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

This unit is about 30 percent Yawdim silty clay, 30 percent Badland, and 20 percent Cabbart silt loam. The moderately steep Cabbart soil and the moderately steep to steep Yawdim soil are on the sides and tops of hills and ridges. The areas of Badland are steep to very steep and are in coulees, on ridges, and on escarpments.

Included in this unit are small areas of Gerdrum, Absher, Neldore, and Fleak soils. Also included are small areas of soils that have slopes of less than 15 percent. Included areas make up about 20 percent of the total acreage. These areas do not adversely affect the use and management of this unit as rangeland.

The Yawdim soil is shallow and well drained. It formed in material derived from semiconsolidated shale. Typically, the surface layer is grayish brown silty clay 6 inches thick. The underlying material to a depth of 15 inches is light olive gray silty clay. Below this to a depth of 60 inches or more is light olive gray semiconsolidated shale. Semiconsolidated shale is at a depth of 10 to 20 inches.

Permeability is slow, and available water capacity is very low. Effective rooting depth is limited by the semiconsolidated shale at a depth of 10 to 20 inches. Where this soil is under native vegetation, the average annual wetting depth is 10 to 20 inches. Runoff is rapid to very rapid, and the hazard of water erosion is high. The hazard of soil blowing is high. This soil is droughty.

Badland consists mainly of barren and nearly barren areas that were formed by the active geologic erosion of weakly consolidated, sandy and silty sedimentary beds and semiconsolidated shale. Runoff is rapid or very rapid, and the hazard of water erosion is very high. The hazard of soil blowing is high.

The Cabbart soil is shallow and well drained. It formed in material derived from weakly consolidated, sandy and silty sedimentary beds. Typically, the surface layer is grayish brown silt loam 4 inches thick. The underlying material to a depth of 13 inches is pale olive silt loam. Below this to a depth of 60 inches or more are pale yellow, weakly consolidated, sandy and silty sedimentary beds. Sedimentary beds are at a depth of 10 to 20 inches.

Permeability is moderate, and available water capacity is very low. Effective rooting depth is limited by the sedimentary beds at a depth of 10 to 20 inches. Where this soil is under native vegetation, the average annual wetting depth is 10 to 20 inches. Runoff is medium, and the hazard of water erosion is high. The hazard of soil blowing is high. This soil is calcareous throughout. It is droughty.

This unit is used as rangeland.

Cropland.—This unit is not suited to cultivated crops because of the steepness of slope and the areas of Badland.

Rangeland.—The potential native plant community on the Yawdim soil is mainly western wheatgrass, green needlegrass, thickspike wheatgrass, and Nuttall saltbush. If the range is excessively grazed, the proportion of these plants decreases and the proportion of Sandberg bluegrass, blue grama, big sagebrush, perennial forbs, and rabbitbrush increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,000 pounds per acre of air-dry vegetation in years of above-normal precipitation and 600 pounds in years of below-normal precipitation.

The potential native plant community on the Cabbart soil is mainly bluebunch wheatgrass, little bluestem, western wheatgrass, sideoats grama, and plains muhly. If the range is excessively grazed, the proportion of these grasses decreases and the proportion of needleandthread, perennial short grasses, perennial forbs, and creeping juniper increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,200 pounds per acre of air-dry vegetation in years of above-normal precipitation and 700 pounds in years of below-normal precipitation.

Steepness of slope limits access by livestock and promotes overgrazing of the less sloping areas of these soils. Use of mechanical treatment practices is not practical.

Windbreaks.—This unit is not suited to windbreaks because of droughtiness and the steepness of slope.

Homesite development.—This unit is poorly suited to homesite development. It is limited mainly by the steepness of slope and the large areas of Badland.

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

166—Yawdim-Badland-Gerdrum association. This map unit is on uplands in the western and northern parts of the county. Slope is 8 to 45 percent. Slopes are mainly less than 250 feet long. Elevation is 1,900 to 2,600 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

This unit is about 30 percent Yawdim silty clay, 30 percent Badland, and 20 percent Gerdrum clay loam. The strongly sloping Gerdrum soil is on fans, the moderately steep to steep Yawdim soil is on the side slopes and tops of hills and ridges, and the steep to very steep areas of Badland are on terrace edges, ridges, and escarpments and in coulees.

Included in this unit are small areas of Busby, Fleak, Yamac, Absher, and Vanda soils. Included areas make up about 20 percent of the total acreage. These areas do not adversely affect the use and management of this unit as rangeland.

The Yawdim soil is shallow and well drained. It formed in material derived from semiconsolidated shale. Typically, the surface layer is grayish brown silty clay 6 inches thick. The underlying material to a depth of 15 inches is light olive gray silty clay. Below this to a depth of 60 inches or more is light olive gray semiconsolidated shale. Semiconsolidated shale is at a depth of 10 to 20 inches.

Permeability is slow, and available water capacity is very low. Effective rooting depth is limited by the semiconsolidated shale at a depth of 10 to 20 inches. Where this soil is under native vegetation, the average annual wetting depth is 10 to 20 inches. Runoff is rapid to very rapid, and the hazard of water erosion is high. The hazard of soil blowing is high. This soil is droughty.

Badland consists mainly of barren and nearly barren areas that were formed by active geologic erosion of weakly consolidated, silty and sandy sedimentary beds and semiconsolidated shale. Runoff is very rapid, and the hazard of water erosion is very high. The hazard of soil blowing is very high.

The Gerdrum soil is deep and well drained and is salt- and sodium-affected. It formed in alluvium. Typically, the surface layer, where mixed to a depth of 7 inches, is light brownish gray clay loam. The upper 4 inches of the subsoil is light brownish gray clay, and the lower 9 inches is light brownish gray clay loam. The substratum to a depth of 60 inches or more is mostly light brownish gray clay loam.

Permeability is slow, and available water capacity is moderate. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 20 inches. Runoff is moderate, and the hazard of water erosion is high. The hazard of soil blowing is moderate. This soil is strongly salt-affected and moderately sodium-affected at a depth of about 7 inches.

This unit is used as rangeland.

Cropland.—This unit is not suited to cultivated crops because of the steepness of slope, shallow depth, and droughtiness of the Yawdim soil; the areas of Badland; and the salt- and sodium-affected subsoil of the Gerdrum soil.

Rangeland.—The potential native plant community on the Yawdim soil is mainly western wheatgrass, green needlegrass, thickspike wheatgrass, and Nuttall saltbush. If the range is excessively grazed, the proportion of these plants decreases and the proportion of Sandberg bluegrass, blue grama, big sagebrush, perennial forbs, and rabbitbrush increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,100 pounds per acre of air-dry vegetation in years of above-normal precipitation and 700 pounds in years of below-normal precipitation.

The potential native plant community on the Gerdrum soil is mainly western wheatgrass, green needlegrass, thickspike wheatgrass, winterfat, and needleandthread. If the range is excessively grazed, the proportion of western wheatgrass, green needlegrass, thickspike wheatgrass, and winterfat decreases and the proportion of needleandthread, blue grama, Sandberg bluegrass, big sagebrush, and perennial forbs increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,200 pounds per acre of air-dry vegetation in years of above-normal precipitation and 500 pounds in years of below-normal precipitation.

Steepness of slope limits access by livestock and promotes overgrazing of the less sloping areas of these soils. Trails or walkways can be constructed in places to encourage livestock grazing in areas where access is limited. Use of mechanical treatment practices is not practical.

Windbreaks.—The Yawdim soil is not suited to windbreaks. It is limited mainly by the very low available water capacity and steepness of slope.

The Gerdrum soil is poorly suited to windbreaks. It is salt- and sodium-affected, which limits the choice of trees and shrubs to Russian-olive and silver buffaloberry.

Homesite development.—The soils in this unit are very poorly suited to homesite development. The Yawdim soil is limited mainly by steepness of slope, shallow depth to semiconsolidated shale, and slow permeability. The Gerdrum soil is limited mainly by slow permeability, shrink-swell potential, and low soil strength. In the construction of basements or foundations for dwellings, the limitation of shrink-swell potential can be overcome by backfilling with suitable material that has low shrink-swell potential. If these soils are used for septic tank absorption fields, the limitation of slow permeability can be overcome by increasing the size of the absorption field or by excavating the trench to a suitable depth. The field or trench should be backfilled with gravel. Shrinking

and swelling and low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations. The areas of Badland are not suited to homesite development.

This map unit is in capability subclass VIIe, nonirrigated. The Yawdim soil is in Shallow Clay range site, 10- to 14-inch precipitation zone, and the Gerdrum soil is in Clay Pan range site, 10- to 14-inch precipitation zone.

167—Yawdim-Kirby complex, 8 to 35 percent slopes. This map unit is on uplands in the west-central part of the county. Slopes are mainly less than 250 feet long. Elevation is 1,900 to 2,600 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

This unit is about 50 percent Yawdim silty clay and 35 percent Kirby very channery loam. The strongly sloping to moderately steep Yawdim soil is on the sides of hills and ridges, and the strongly sloping to steep Kirby soil is on the tops of hills and ridges.

Included in this unit are small areas of Cabbart, Fleak, and Gerdrum soils. Included areas make up about 15 percent of the total acreage. These areas do not adversely affect the use and management of this unit as rangeland.

The Yawdim soil is shallow and well drained. It formed in material derived from semiconsolidated shale. Typically, the surface layer is grayish brown silty clay 6 inches thick. The underlying material to a depth of 15 inches is light olive gray silty clay. Below this to a depth of 60 inches or more is light olive gray semiconsolidated shale. Semiconsolidated shale is at a depth of 10 to 20 inches.

Permeability is slow, and available water capacity is very low. Effective rooting depth is limited by the semiconsolidated shale at a depth of 10 to 20 inches. Where this soil is under native vegetation, the average annual wetting depth is 10 to 20 inches. Runoff is rapid to very rapid, and the hazard of water erosion is high. The hazard of soil blowing is high. This soil is droughty.

The Kirby soil is deep and well drained. It formed in material derived from sandstone and shale. Typically, the surface layer is light brown very channery loam 5 inches thick. The upper 13 inches of the underlying material is light brown very channery loam, and the lower part to a depth of 60 inches or more is light brown shale and sandstone fragments. Sandstone and shale fragments are at a depth of 10 to 20 inches.

Permeability is rapid, and available water capacity is very low. Effective rooting depth is limited by the sandstone and shale fragments at a depth of 10 to 20 inches. Where this soil is under native vegetation, the average annual wetting depth is about 36 inches. Runoff is medium, and the hazard of water erosion is high. The hazard of soil blowing is moderate. This soil is droughty.

These soils are used as rangeland.

Cropland.—These soils are not suited to cultivated crops because of the shallow depth to semiconsolidated shale in the Yawdim soil, steepness of slope, droughtiness, and the shallow depth to shale and sandstone fragments in the Kirby soil.

Rangeland.—The potential native plant community on the Yawdim soil is mainly western wheatgrass, green needlegrass, thickspike wheatgrass, and Nuttall saltbush. If the range is excessively grazed, the proportion of these plants decreases and the proportion of Sandberg bluegrass, blue grama, big sagebrush, perennial forbs, and rabbitbrush increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,100 pounds per acre of air-dry vegetation in years of above-normal precipitation and 700 pounds in years of below-normal precipitation.

The potential native plant community on the Kirby soil is mainly bluebunch wheatgrass, little bluestem, sideoats grama, plains muhly, and thickspike wheatgrass. If the range is excessively grazed, the proportion of these grasses decreases and the proportion of needleandthread, perennial short grasses, perennial forbs, skunkbush sumac, and juniper increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 700 pounds per acre of air-dry vegetation in years of above-normal precipitation and 400 pounds in years of below-normal precipitation.

Use of mechanical treatment practices on these soils is not practical.

Windbreaks.—These soils are not suited to windbreaks because of the very low available water capacity.

Homesite development.—These soils are poorly suited to homesite development. The Yawdim soil is limited mainly by steepness of slope in some areas, slow permeability, low soil strength, shrink-swell potential, and shallow depth to semiconsolidated shale. In the construction of basements or foundations for dwellings, the limitation of shrink-swell potential can be overcome by backfilling with suitable material that has low shrink-swell potential. This soil is poorly suited to septic tank absorption fields because of the shallow depth to semiconsolidated shale and slow permeability. Shrinking and swelling, low soil strength, and shallow depth to shale can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations.

The less sloping areas of the Kirby soil are suited to homesite development. These areas are limited mainly by the sandstone and shale fragments at a depth of 10 to 20 inches. Slope is a concern in installing septic tank absorption fields. Absorption lines should be installed on

the contour. The rapid permeability of the soil may cause effluent from absorption fields to contaminate ground water. This soil is suitable for use as base material for roads and streets. It may need to be crushed to yield fragments of the proper size and then mixed with soil material for increased strength and stability. The steeper areas of this soil are poorly suited to homesite development because of the slope.

This map unit is in capability subclass VIIe, nonirrigated. The Yawdim soil is in Shallow Clay range site, 10- to 14-inch precipitation zone, and the Kirby soil is in Very Shallow range site, 10- to 14-inch precipitation zone.

168—Zahill loam, 2 to 8 percent slopes. This deep, well drained soil is on undulating and gently rolling glaciated uplands in the northeastern part of the county. It formed in glacial till. Slopes are mainly less than 1,000 feet long. Elevation is 2,000 to 2,500 feet. The average annual precipitation is about 15 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Vida, Macar, Thoeny, and Cambert soils. The salt- and sodium-affected Thoeny soils are in shallow depressional areas on fans and foot slopes. The salts and sodium reduce the availability of moisture and plant nutrients and thus limit crop yields. The Cambert soils are moderately deep to root-limiting, weakly consolidated, silty sedimentary beds. The Vida and Macar soils do not adversely affect the use and management of this unit as rangeland and for nonirrigated farming.

Typically, this Zahill soil has a surface layer of brown loam 6 inches thick. The upper 16 inches of the underlying material is pale brown clay loam, and the lower part to a depth of 60 inches or more is light brownish gray clay loam.

Permeability is moderately slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 30 inches. Runoff is slow to medium, and the hazard of water erosion is slight to moderate. The hazard of soil blowing is high. The soil is calcareous throughout.

This soil is used mainly for nonirrigated farming. It is also used as rangeland. The main nonirrigated crops are wheat, oats, and barley.

Cropland.—This soil is well suited to nonirrigated crops. It is limited mainly by the hazards of soil blowing and water erosion. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, stubble mulch tillage, and grassed waterways reduce soil blowing and water erosion. Crops respond to application of nitrogen and phosphorus fertilizer.

Rangeland.—The potential native plant community is mainly western wheatgrass, green needlegrass, little bluestem, bluebunch wheatgrass, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, perennial short grasses, fringed sagewort, and perennial forbs increases. If excessive grazing continues, plants such as annuals, weedlike forbs, and clubmoss may invade. The potential native plant community produces about 1,800 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,200 pounds in years of below-normal precipitation.

The surface layer is susceptible to water erosion and soil blowing if it is disturbed or the range is overgrazed. Proper grazing use insures good plant vigor and adequate plant cover. Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Where clubmoss and blue grama are the dominant vegetation, practices such as scalping or shallow chiseling can be used to improve the rangeland. Such practices increase water infiltration, reduce plant competition, and allow the more desirable native plants to increase.

Windbreaks.—This soil is suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian elm, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, and skunkbush sumac.

Homesite development.—This soil is poorly suited to homesite development. It is limited mainly by moderately slow permeability, low soil strength, and shrink-swell potential. In the construction of basements or foundations for dwellings, the limitation of shrink-swell potential can be overcome by backfilling with suitable material that has low shrink-swell potential. If this soil is used for septic tank absorption fields, use of gravel backfill in the absorption line trench, excavated to a suitable depth, helps to compensate for the limitation of moderately slow permeability. Shrinking and swelling and low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations.

This map unit is in capability subclass IIIe, nonirrigated. It is in Silty range site, 10- to 14-inch precipitation zone.

169—Zahill loam, 8 to 15 percent slopes. This deep, well drained soil is on rolling glaciated uplands in the northeastern part of the county. It formed in glacial till. Slopes are mainly less than 250 feet long. Elevation is 2,000 to 2,500 feet. The average annual precipitation is about 15 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Vida, Macar, Absher, and Cabba soils. Also included are small areas of Zahill soils that have a very stony surface layer. The shallow Cabba soils are on the tops of hills and ridges. They are underlain by root-limiting, weakly consolidated, sandy and silty sedimentary beds at a depth of 10 to 20

inches. The strongly salt- and sodium-affected Absher soils are on fans and foot slopes. The high content of salts and sodium reduces the moisture and nutrients available to plants and thus limits crop yields. The areas of Zahill soils that have a very stony surface layer are primarily north of Cow Creek, along the Dawson County line. The stones in these soils make tillage impractical. The Vida and Macar soils do not adversely affect the use and management of this unit as rangeland and for nonirrigated farming.

Typically, this Zahill soil has a surface layer of brown loam 6 inches thick. The upper 16 inches of the underlying material is pale brown clay loam, and the lower part to a depth of 60 inches or more is light brownish gray clay loam.

Permeability is moderately slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 27 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high. The soil is calcareous throughout.

This soil is used as rangeland and for nonirrigated farming. The main nonirrigated crops are wheat, oats, and barley.

Cropland.—This soil is suited to nonirrigated crops. It is limited mainly by the hazards of soil blowing and water erosion. Minimum tillage, contour cultivation, stripcropping, tall grass barriers, grassed waterways, and return of crop residue to the soil reduce soil blowing and water erosion. Tall grass barriers also reduce evaporation and trap snow, which increases the amount of moisture in the soil. Return of crop residue also helps to maintain good soil tilth. Chiseling stubble fields in fall on the contour or across the slope reduces runoff and water erosion.

Rangeland.—The potential native plant community is mainly little bluestem, bluebunch wheatgrass, sideoats grama, plains muhly, western wheatgrass, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, perennial short grasses, fringed sagewort, and perennial forbs increases. If excessive grazing continues, plants such as annuals, weedlike forbs, and clubmoss may invade. The potential native plant community produces about 1,600 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,000 pounds in years of below-normal precipitation.

The surface layer is susceptible to water erosion and soil blowing if it is disturbed or the range is overgrazed. Proper grazing use insures good plant vigor and adequate plant cover. This soil is suitable for seeding to native or adapted forage species. Where clubmoss and blue grama are the dominant vegetation, practices such as scalping or shallow chiseling can be used to improve the rangeland. Such practices increase water infiltration, reduce plant competition, and allow the more desirable native plants to increase. Conducting fieldwork on the contour or across the slope, where practical, reduces erosion and conserves moisture.

Windbreaks.—This soil is suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian elm, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, and skunkbush sumac.

Homesite development.—This soil is poorly suited to homesite development. It is limited mainly by moderately slow permeability, low soil strength, and shrink-swell potential. In the construction of basements or foundations for dwellings, the limitation of shrink-swell potential can be overcome by backfilling with suitable material that has low shrink-swell potential. If this soil is used for septic tank absorption fields, use of gravel backfill in the absorption line trench, excavated to a suitable depth, helps to compensate for the limitation of moderately slow permeability. Slope is a concern in installing septic tank absorption fields. Absorption lines should be installed on the contour. Shrinking and swelling and low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations.

This map unit is in capability subclass IVe, nonirrigated. It is in Silty range site, 10- to 14-inch precipitation zone.

170—Zahill loam, 15 to 45 percent slopes. This deep, well drained soil is on the sides and tops of hills and ridges in the northeastern part of the county. It formed in glacial till. Slopes are mainly less than 250 feet long. Elevation is 2,000 to 2,500 feet. The average annual precipitation is about 15 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

Included in this unit are small areas of Cabba, Yawdim, Vida, and Absher soils. Also included are small areas of Zahill soils that have a very stony loam surface layer. These areas do not adversely affect the use and management of this unit as rangeland.

Typically, this Zahill soil has a surface layer of brown loam 6 inches thick. The upper 16 inches of the underlying material is pale brown clay loam, and the lower part to a depth of 60 inches or more is light brownish gray clay loam.

Permeability is moderately slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 24 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high. The soil is calcareous throughout.

This soil is used as rangeland.

Cropland.—This soil is very poorly suited to cultivated ;rops because of the steepness of slope.

Rangeland.—The potential native plant community is nainly little bluestem, bluebunch wheatgrass, sideoats ;rama, plains muhly, western wheatgrass, and winterfat. f the range is excessively grazed, the proportion of hese plants decreases and the proportion of ıeedleandthread, perennial short grasses, fringed ;agewort, and perennial forbs increases. If excessive ;razing continues, plants such as annuals, weedlike orbs, and clubmoss may invade. The potential native ›lant community produces about 1,400 pounds per acre ›f air-dry vegetation in years of above-normal ›recipitation and 800 pounds in years of below-normal ›recipitation.

Grazing should be delayed until the soil is firm and the nore desirable forage plants have achieved sufficient ;rowth to withstand grazing pressure. This soil is very ›oorly suited to rangeland seeding or mechanical reatment practices because of the steepness of slope.

Windbreaks.—This soil is not suited to windbreaks. It s limited mainly by the steepness of slope.

Homesite development.—This soil is poorly suited to ıomesite development because of the steepness of ;lope.

This map unit is in capability subclass VIe, ıonirrigated. It is in Thin Silty range site, 10- to 14-inch ›recipitation zone.

171—Zahill-Badland complex, 25 to 45 percent ;lopes. This map unit is on uplands in the northeastern ›art of the county. Slopes are mainly less than 250 feet ong. Elevation is 2,000 to 2,500 feet. The average ;nnual precipitation is about 15 inches, the average ;nnual air temperature is about 43 degrees F, and the ;verage frost-free season is about 115 days.

This unit is about 35 percent Zahill loam and 35 ›ercent Badland. The steep Zahill soil is on the sides ;nd tops of hills and ridges. The steep to very steep ;reas of Badland are on narrow ridges, in deep coulees, ;nd on escarpments.

Included in this unit are small areas of Vida, Absher, Cabba, Yawdim, and Adger. Included areas make up ;bout 30 percent of the total acreage. These areas do ıot adversely affect the use and management of this unit ;s rangeland.

The Zahill soil is deep and well drained. It formed in ;lacial till. Typically, the surface layer is brown loam 6 nches thick. The upper 16 inches of the underlying naterial is pale brown clay loam, and the lower part to a ;epth of 60 inches or more is light brownish gray clay oam.

Permeability is moderately slow, and available water ;apacity is high. Effective rooting depth is 60 inches or nore. Where this soil is under native vegetation, the ;verage annual wetting depth is about 24 inches. Runoff s medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high. This soil is calcareous throughout.

Badland consists mainly of barren and nearly barren areas that were formed by active geologic erosion of weakly consolidated, sandy and silty sedimentary beds and semiconsolidated shale. Runoff is rapid or very rapid, and the hazard of water erosion is very high. The hazard of soil blowing is high.

This unit is used as rangeland.

Cropland.—This unit is not suited to cultivated crops because of steepness of slope and the areas of Badland.

Rangeland.—The potential native plant community on the Zahill soil is mainly little bluestem, bluebunch wheatgrass, sideoats grama, plains muhly, western wheatgrass, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, perennial short grasses, fringed sagewort, and perennial forbs increases. If excessive grazing continues, plants such as annuals, weedlike forbs, and clubmoss may invade. The potential native plant community produces about 1,400 pounds per acre of air-dry vegetation in years of above-normal precipitation and 800 pounds in years of below-normal precipitation.

Steepness of slope limits access by livestock and promotes overgrazing of the less sloping areas. Trails or walkways can be constructed in places to encourage livestock grazing in areas where access is limited. Use of mechanical treatment practices is not practical.

Windbreaks.—This unit is not suited to windbreaks because of the steepness of slope and the areas of Badland.

Homesite development.—This unit is very poorly suited to homesite development because of the steepness of slope and the areas of Badland.

This map unit is in capability subclass VIIe, nonirrigated. The Zahill soil is in Thin Silty range site, 10- to 14-inch precipitation zone.

172—Zahill-Cabba loams, 8 to 15 percent slopes. This map unit is on uplands in the northeastern part of the county. Slopes are mainly less than 1,000 feet long. Elevation is 2,000 to 2,500 feet. The average annual precipitation is about 15 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

This unit is about 50 percent Zahill loam and 35 percent Cabba loam. The Zahill soil is on the upper side slopes and tops of hills and ridges, and the Cabba soil is on side slopes and the edges of coulees.

Included in this unit are small areas of Vida, Yawdim, Dast, and Shambo soils. Included areas make up about 15 percent of the total acreage. The shallow Yawdim soils are on hillsides. They are underlain by root-limiting, semiconsolidated shale at a depth of 10 to 20 inches. The moderately deep Dast soils are also on hillsides.

They are underlain by weakly consolidated, sandy sedimentary beds at a depth of 20 to 40 inches. The Shambo and Vida soils do not adversely affect the use and management of this unit as rangeland and for nonirrigated farming.

The Zahill soil is deep and well drained. It formed in glacial till. Typically, the surface layer is brown loam 6 inches thick. The upper 16 inches of the underlying material is pale brown clay loam, and the lower part to a depth of 60 inches or more is light brownish gray clay loam.

Permeability is moderately slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 27 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high. This soil is calcareous throughout.

The Cabba soil is shallow and well drained. It formed in material derived from weakly consolidated, sandy and silty sedimentary beds. Typically, the surface layer is light yellowish brown loam 5 inches thick. The underlying material to a depth of 15 inches is light yellowish brown and pale yellow loam. Below this to a depth of 60 inches or more are pale yellow, weakly consolidated, sandy and silty sedimentary beds. Sedimentary beds are at a depth of 10 to 20 inches.

Permeability is moderate, and available water capacity is very low. Effective rooting depth is limited by the sedimentary beds at a depth of 10 to 20 inches. Where this soil is under native vegetation, the average annual wetting depth is 10 to 20 inches. Runoff is medium, and the hazard of water erosion is high. The hazard of soil blowing is high. This soil is calcareous throughout. It is droughty.

These soils are used as rangeland and for nonirrigated farming. The main nonirrigated crops are wheat, oats, and barley.

Cropland.—These soils are suited to nonirrigated crops. They are limited mainly by the hazards of soil blowing and water erosion. The Cabba soil is also limited by droughtiness and shallow depth to root-limiting sedimentary beds. Minimum tillage, contour cultivation, stripcropping, tall grass barriers, grassed waterways, and return of crop residue to the soil reduce soil blowing and water erosion. Tall grass barriers also reduce evaporation and trap snow, which increases the amount of moisture in the soil. Return of crop residue also helps to maintain good soil tilth. Chiseling stubble fields in fall on the contour or across the slope reduces runoff and water erosion. Subsoiling the Cabba soil increases its effective rooting depth. Crops respond to application of nitrogen and phosphorus fertilizer.

Rangeland.—The potential native plant community on the Zahill soil is mainly little bluestem, bluebunch wheatgrass, sideoats grama, plains muhly, western wheatgrass, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, perennial short grasses, fringed sagewort, and perennial forbs increases. If excessive grazing continues, plants such as annuals, weedlike forbs, and clubmoss may invade. The potential native plant community produces about 1,600 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,000 pounds in years of below-normal precipitation.

The potential native plant community on the Cabba soil is mainly bluebunch wheatgrass, little bluestem, western wheatgrass, plains muhly, and needleandthread. If the range is excessively grazed, the proportion of bluebunch wheatgrass, western wheatgrass, and plains muhly decreases and the proportion of needleandthread, perennial short grasses, threadleaf sedge, and perennial forbs increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,200 pounds per acre of air-dry vegetation in years of above-normal precipitation and 700 pounds in years of below-normal precipitation.

The surface layer of these soils is susceptible to water erosion and soil blowing if it is disturbed or the range is overgrazed. Proper grazing use insures good plant vigor and adequate plant cover. Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Areas of deteriorated rangeland can be improved by mechanical treatment practices such as shallow chiseling and scalping. Conducting fieldwork on the contour or across the slope, where practical, reduces erosion and conserves moisture.

Windbreaks.—The Zahill soil is suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian elm, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, and skunkbush sumac.

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

Homesite development.—These soils generally are poorly suited to homesite development. The Zahill soil is limited mainly by moderately slow permeability, low soil strength, and shrink-swell potential. In the construction of basements or foundations for dwellings, the limitation of shrink-swell potential can be overcome by backfilling with suitable material that has low shrink-swell potential. If this soil is used for septic tank absorption fields, use of gravel backfill in the absorption line trench, excavated to a suitable depth, helps to compensate for the limitation of moderately slow permeability. Slope is a concern in installing septic tank absorption fields. Absorption lines should be installed on the contour. Shrinking and swelling and low soil strength can adversely affect the

quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations.

The Cabba soil is limited for use as homesites mainly by low soil strength and slow permeability of the underlying sedimentary beds. This soil is poorly suited to septic tank absorption fields because of the slow permeability of the underlying sedimentary beds. Deep cuts needed to provide nearly level road surfaces can expose soft sedimentary beds that can easily be excavated. Low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome this limitation.

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

173—Zahill-Cabba loams, 15 to 45 percent slopes. This map unit is on uplands in the northeastern part of the county. Slopes are mainly less than 250 feet long. Elevation is 2,000 to 2,500 feet. The average annual precipitation is about 15 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

This unit is about 40 percent Zahill loam and 40 percent Cabba loam. The Zahill and Cabba soils are on the sides and tops of hills and ridges on glaciated uplands.

Included in this unit are small areas of Dast, Vida, Macar, and Yawdim soils. Also included are small areas of sandstone and shale outcroppings. Included areas make up about 20 percent of the total acreage. The areas of soil do not adversely affect the use and management of this unit as rangeland. The areas of sandstone and shale outcroppings limit the range production of the unit.

The Zahill soil is deep and well drained. It formed in glacial till. Typically, the surface layer is brown loam 6 inches thick. The upper 16 inches of the underlying material is pale brown clay loam, and the lower part to a depth of 60 inches or more is light brownish gray clay loam.

Permeability is moderately slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 24 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is high. This soil is calcareous throughout.

The Cabba soil is shallow and well drained. It formed in material derived from weakly consolidated, sandy and silty sedimentary beds. Typically, the surface layer is light yellowish brown loam 5 inches thick. The underlying material to a depth of 15 inches is light yellowish brown and pale yellow loam. Below this to a depth of 60 inches or more are pale yellow, weakly consolidated, sandy and silty sedimentary beds. Sedimentary beds are at a depth of 10 to 20 inches.

Permeability is moderate, and available water capacity is very low. Effective rooting depth is limited by the sedimentary beds at a depth of 10 to 20 inches. Where this soil is under native vegetation, the average annual wetting depth is 10 to 20 inches. Runoff is medium, and the hazard of water erosion is high. The hazard of soil blowing is high. This soil is calcareous throughout. It is droughty.

These soils are used as rangeland.

Cropland.—These soils are not suited to cultivated crops because of the steepness of slope.

Rangeland.—The potential native plant community on the Zahill soil is mainly little bluestem, bluebunch wheatgrass, sideoats grama, plains muhly, western wheatgrass, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, perennial short grasses, fringed sagewort, and perennial forbs increases. If excessive grazing continues, plants such as annuals, weedlike forbs, and clubmoss may invade. The potential native plant community produces about 1,400 pounds per acre of air-dry vegetation in years of above-normal precipitation and 850 pounds in years of below-normal precipitation.

The potential native plant community on the Cabba soil is mainly bluebunch wheatgrass, little bluestem, western wheatgrass, plains muhly, and sideoats grama. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, perennial short grasses, threadleaf sedge, and perennial forbs increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,200 pounds per acre of air-dry vegetation in years of above-normal precipitation and 700 pounds in years of below-normal precipitation.

Steepness of slope limits access by livestock and promotes overgrazing of the less sloping areas of these soils. The soils are not suited to rangeland seeding and mechanical treatment practices because of the steepness of slope. Trails or walkways can be constructed in places to encourage livestock grazing in areas where access is limited.

Windbreaks.—These soils are not suited to windbreaks because of the steepness of slope.

Homesite development.—These soils are poorly suited to homesite development because of the steepness of slope.

This map unit is in capability subclass VIIe, nonirrigated. The Zahill soil is in Thin Silty range site, 10- to 14-inch precipitation zone, and the Cabba soil is in Shallow range site, 10- to 14-inch precipitation zone.

174—Zahill-Yawdim complex, 4 to 15 percent slopes. This map unit is on uplands in the northeastern part of the county. Slopes are mainly less than 250 feet long. Elevation is 2,000 to 2,500 feet. The average annual precipitation is about 15 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

This unit is about 45 percent Zahill loam and 40 percent Yawdim silty clay. The Zahill soil is on the upper side slopes and tops of hills, and the Yawdim soil is on side slopes and the edges of coulees.

Included in this unit are small areas of Weingart, Gerdrum, Adger, and Thoeny soils. Included areas make up about 15 percent of the total acreage. These areas do not adversely affect the use and management of this unit as rangeland.

The Zahill soil is deep and well drained. It formed in glacial till. Typically, the surface layer is brown loam 6 inches thick. The upper 16 inches of the underlying material is pale brown clay loam, and the lower part to a depth of 60 inches or more is light brownish gray clay loam.

Permeability is moderately slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 27 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high. This soil is calcareous throughout.

The Yawdim soil is shallow and well drained. It formed in material derived from semiconsolidated shale. Typically, the surface layer is grayish brown silty clay 6 inches thick. The underlying material to a depth of 15 inches is light olive gray silty clay. Below this to a depth of 60 inches or more is light olive gray semiconsolidated shale. Semiconsolidated shale is at a depth of 10 to 20 inches.

Permeability is slow, and available water capacity is very low. Effective rooting depth is limited by the semiconsolidated shale at a depth of 10 to 20 inches. Where this soil is under native vegetation, the average annual wetting depth is 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is high. This soil is droughty.

These soils are used as rangeland.

Cropland.—The Yawdim soil is poorly suited to cultivated crops mainly because it is droughty and is low in productivity.

Rangeland.—The potential native plant community on the Zahill soil is mainly little bluestem, bluebunch wheatgrass, sideoats grama, plains muhly, western wheatgrass, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, perennial short grasses, fringed sagewort, and perennial forbs increases. If excessive grazing continues, plants such as annuals, weedlike forbs, and clubmoss may invade. The potential native plant community produces about 1,600 pounds per acre of air-dry vegetation in years of above-normal precipitation and 1,000 pounds in years of below-normal precipitation.

The potential native plant community on the Yawdim soil is mainly western wheatgrass, green needlegrass, thickspike wheatgrass, and Nuttall saltbush. If the range is excessively grazed, the proportion of these plants decreases and the proportion of Sandberg bluegrass, blue grama, big sagebrush, perennial forbs, and rabbitbrush increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,000 pounds per acre of air-dry vegetation in years of above-normal precipitation and 600 pounds in years of below-normal precipitation.

Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice on these soils. Areas of deteriorated rangeland on the Zahill soil can be improved by mechanical treatment practices such as shallow chiseling and scalping. Conducting fieldwork on the contour or across the slope, where practical, reduces erosion and conserves moisture.

Windbreaks.—The Zahill soil is suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian elm, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, and skunkbush sumac.

The Yawdim soil is not suited to windbreaks. It is limited mainly by the very low available water capacity.

Homesite development.—These soils are poorly suited to homesite development. The Zahill soil is limited mainly by moderately slow permeability, low soil strength, and shrink-swell potential. In the construction of basements or foundations for dwellings, the limitation of shrink-swell potential can be overcome by backfilling with suitable material that has low shrink-swell potential. If this soil is used for septic tank absorption fields, use of gravel backfill in the absorption line trench, excavated to a suitable depth, helps to compensate for the limitation of moderately slow permeability. Slope is a concern in installing septic tank absorption fields. Absorption lines should be installed on the contour. Shrinking and swelling and low soil strength can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations.

The Yawdim soil is limited for use as homesites mainly by shallow depth to semiconsolidated shale, shrink-swell potential, low soil strength, and slow permeability. In the construction of basements or foundations for dwellings, the limitation of shrink-swell potential can be overcome by backfilling with suitable material that has low shrink-swell potential. This soil is poorly suited to septic tank absorption fields because of slow permeability and shallow depth to semiconsolidated shale. Shrinking and swelling, low soil strength, and shallow depth to

semiconsolidated shale can adversely affect the quality of roadbeds and road surfaces. Adequate drainage and the use of suitable fill material that is properly compacted can overcome these limitations.

This map unit is in capability subclass VIe, nonirrigated. The Zahill soil is in Silty range site, 10- to 14-inch precipitation zone, and the Yawdim soil is in Shallow Clay range site, 10- to 14-inch precipitation zone.

175—Zahill-Yawdim complex, 15 to 45 percent slopes. This map unit is on the sides and tops of hills and ridges of glaciated uplands in the northeastern part of the county. Slopes are mainly less than 250 feet long. Elevation is 2,000 to 2,500 feet. The average annual precipitation is about 15 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 115 days.

This unit is about 40 percent Zahill loam and 40 percent Yawdim silty clay.

Included in this unit are small areas of Gerdrum, Absher, Vida, Weingart, and Thoeny soils. Also included are small areas of shale outcroppings. Included areas make up about 20 percent of the total acreage. The areas of soil do not adversely affect the use and management of this unit as rangeland. The areas of shale outcroppings limit the range production of the unit.

The Zahill soil is deep and well drained. It formed in glacial till. Typically, the surface layer is brown loam 6 inches thick. The upper 16 inches of the underlying material is pale brown clay loam, and the lower part to a depth of 60 inches or more is light brownish gray clay loam.

Permeability is moderately slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 24 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is high. This soil is calcareous throughout.

The Yawdim soil is shallow and well drained. It formed in material derived from semiconsolidated shale. Typically, the surface layer is grayish brown silty clay 6 inches thick. The underlying material to a depth of 15 inches is light olive gray silty clay. Below this to a depth of 60 inches or more is light olive gray semiconsolidated shale. Semiconsolidated shale is at a depth of 10 to 20 inches.

Permeability is slow, and available water capacity is very low. Effective rooting depth is limited by the semiconsolidated shale at a depth of 10 to 20 inches. Where this soil is under native vegetation, the average annual wetting depth is 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is high. This soil is droughty.

These soils are used as rangeland.

Cropland.—These soils are not suited to cultivated crops because of the steepness of slope.

Rangeland.—The potential native plant community on the Zahill soil is mainly little bluestem, bluebunch wheatgrass, sideoats grama, plains muhly, western wheatgrass, and winterfat. If the range is excessively grazed, the proportion of these plants decreases and the proportion of needleandthread, perennial short grasses, fringed sagewort, and perennial forbs increases. If excessive grazing continues, plants such as annuals, weedlike forbs, and clubmoss may invade. The potential native plant community produces about 1,400 pounds per acre of air-dry vegetation in years of above-normal precipitation and 850 pounds in years of below-normal precipitation.

The potential native plant community on the Yawdim soil is mainly western wheatgrass, green needlegrass, thickspike wheatgrass, and Nuttall saltbush. If the range is excessively grazed, the proportion of these plants decreases and the proportion of Sandberg bluegrass, blue grama, big sagebrush, perennial forbs, and rabbitbrush increases. If excessive grazing continues, plants such as annuals and weedlike forbs may invade. The potential native plant community produces about 1,000 pounds per acre of air-dry vegetation in years of above-normal precipitation and 600 pounds in years of below-normal precipitation.

Steepness of slope limits access by livestock and promotes overgrazing of the less sloping areas of these soils. Trails or walkways can be constructed in places to encourage livestock grazing in areas where access is limited. The soils are not suited to rangeland seeding or mechanical treatment practices because of the steepness of slope.

Windbreaks.—These soils are not suited to windbreaks. They are limited mainly by the steepness of slope.

Homesite development.—These soils are poorly suited to homesite development because of the steepness of slope and the shallow depth to semiconsolidated shale in the Yawdim soil.

This map unit is in capability subclass VIIe, nonirrigated. The Zahill soil is in Thin Silty range site, 10- to 14-inch precipitation zone, and the Yawdim soil is in Shallow Clay range site, 10- to 14-inch precipitation zone.

Prime Farmland

Prime farmland is one of several kinds of important farmland defined by the U.S. Department of Agriculture. It is of major importance in providing the nation's short- and long-range needs for food and fiber. The supply of high quality farmland is limited, and the U. S. Department of Agriculture recognizes that responsible levels of government, as well as individuals, must encourage and facilitate the use of our nation's prime farmland with wisdom and foresight.

Prime farmland, as defined by the U.S. Department of Agriculture, is the land that is best suited to producing food, feed, forage, fiber, and oilseed crops. It has the soil quality, length of growing season, and moisture supply needed to economically produce a sustained high yield of crops when it is managed properly. Prime farmland produces the highest yields with minimal energy and economic resources, and farming it results in the least disturbance of the environment.

Prime farmland may now be in cultivated cropland, rangeland, woodland, or other uses. It does not include urban and built-up areas or water areas. To qualify as prime farmland, it must either be used for producing food or fiber or be available for these uses. For more detailed information on the criteria for prime farmland, consult the local office of the Soil Conservation Service.

The prime farmland in this survey area has an adequate and dependable supply of water for irrigation. It also has a favorable temperature and length of growing season and an acceptable level of acidity or alkalinity. Some soils may be effervescent in the surface layer, but the finely divided calcium carbonate is less than 5 percent. Prime farmland has few if any rocks and is permeable to water and air. Prime farmland is not excessively erodible, is not saturated with water for long periods, and is not frequently flooded. The slope ranges from 0 to 4 percent.

The following map units, or soils, in McCone County qualify as prime farmland if they are irrigated. The location of each map unit is shown on the detailed soil maps at the back of this publication. The extent of each unit is given in table 4. The soil qualities that affect use and management are described in the section "Detailed Soil Map Units." This list does not constitute a recommendation for a particular land use.

13 Bowbells loam
14 Bryant silt loam, 0 to 4 percent slopes
63 Farland silt loam, 0 to 4 percent slopes
64 Farnuf loam, 0 to 4 percent slopes
74 Glendive loam
75 Glendive loam, protected
76 Glendive silty clay loam
77 Glendive silty clay loam, protected
80 Harlem silty clay
81 Harlem silty clay, protected
82 Havre silt loam
83 Havre silt loam, protected
84 Havre silty clay loam
85 Havre silty clay loam, protected
86 Havrelon loam
87 Havrelon loam, protected
89 Havrelon silty clay loam
90 Havrelon silty clay loam, protected
96 Hoffmanville silty clay, protected
102 Lohler silty clay loam, protected
103 Lohler silty clay
104 Lohler silty clay, protected
107 Macar loam, 0 to 4 percent slopes
123 Savage silty clay loam, 0 to 4 percent slopes
141 Turner loam, 0 to 4 percent slopes
156 Williams loam, 0 to 2 percent slopes
157 Williams loam, 2 to 4 percent slopes
158 Williams-Vida complex, 2 to 4 percent slopes

About 12,250 acres already is irrigated and meets all the requirements for prime farmland. Approximately 9,100 acres of this total is made up of Harlem silty clay, protected; Havre silty clay loam, protected; Havrelon silty clay loam, protected, and Lohler silty clay loam, protected. These soils are on terraces of the Missouri River and are associated with general soil map unit 2. They are mainly used for alfalfa hay, spring wheat, and barley. The remaining 3,150 acres is made up of small areas on the Missouri River terraces and small scattered areas along Redwater River, Prairie Elk Creek, and their tributaries. These areas are in general soil map units 1, 2, and 3. They are used mainly for alfalfa hay.

Accessibility Statement

The Natural Resources Conservation Service (NRCS) is committed to making its information accessible to all of its customers and employees. If you are experiencing accessibility issues and need assistance, please contact our Helpdesk by phone at (800) 457-3642 or by e-mail at ServiceDesk-FTC@ftc.usda.gov. For assistance with publications that include maps, graphs, or similar forms of information, you may also wish to contact our State or local office. You can locate the correct office and phone number at http://offices.sc.egov.usda.gov/locator/app.

The USDA Target Center can convert USDA information and documents into alternative formats, including Braille, large print, video description, diskette, and audiotape. For more information, visit the TARGET Center's Web site (http://www.targetcenter.dm.usda.gov/) or call (202) 720-2600 (Voice/TTY).

Nondiscrimination Policy

The U.S. Department of Agriculture (USDA) prohibits discrimination against its customers, employees, and applicants for employment on the basis of race, color, national origin, age, disability, sex, gender identity, religion, reprisal, and where applicable, political beliefs, marital status, familial or parental status, sexual orientation, whether all or part of an individual's income is derived from any public assistance program, or protected genetic information. The Department prohibits discrimination in employment or in any program or activity conducted or funded by the Department. (Not all prohibited bases apply to all programs and/or employment activities.)

To File an Employment Complaint

If you wish to file an employment complaint, you must contact your agency's EEO Counselor (http://directives.sc.egov.usda.gov/33081.wba) within 45 days of the date of the alleged discriminatory act, event, or personnel action. Additional information can be found online at http://www.ascr.usda.gov/complaint_filing_file.html.

To File a Program Complaint

If you wish to file a Civil Rights program complaint of discrimination, complete the USDA Program Discrimination Complaint Form, found online at http://www.ascr.usda.gov/complaint_filing_cust.html or at any USDA office, or call (866) 632-9992 to request the form. You may also write a letter containing all of the information requested in the form. Send your completed complaint form or letter by mail to U.S. Department of Agriculture; Director, Office of Adjudication; 1400 Independence Avenue, S.W.; Washington, D.C. 20250-9419; by fax to (202) 690-7442; or by email to program.intake@usda.gov.

Persons with Disabilities

If you are deaf, are hard of hearing, or have speech disabilities and you wish to file either an EEO or program complaint, please contact USDA through the Federal Relay Service at (800) 877-8339 or (800) 845-6136 (in Spanish).

If you have other disabilities and wish to file a program complaint, please see the contact information above. If you require alternative means of communication for program information (e.g., Braille, large print, audiotape, etc.), please contact USDA's TARGET Center at (202) 720-2600 (voice and TDD).