United States
Department of
Agriculture

Soil
Conservation
Service

Forest Service

Department of
the Interior

Bureau of
Land Management

In cooperation with the
Utah Agricultural
Experiment Station

Soil Survey of Rich County Utah

HOW TO USE

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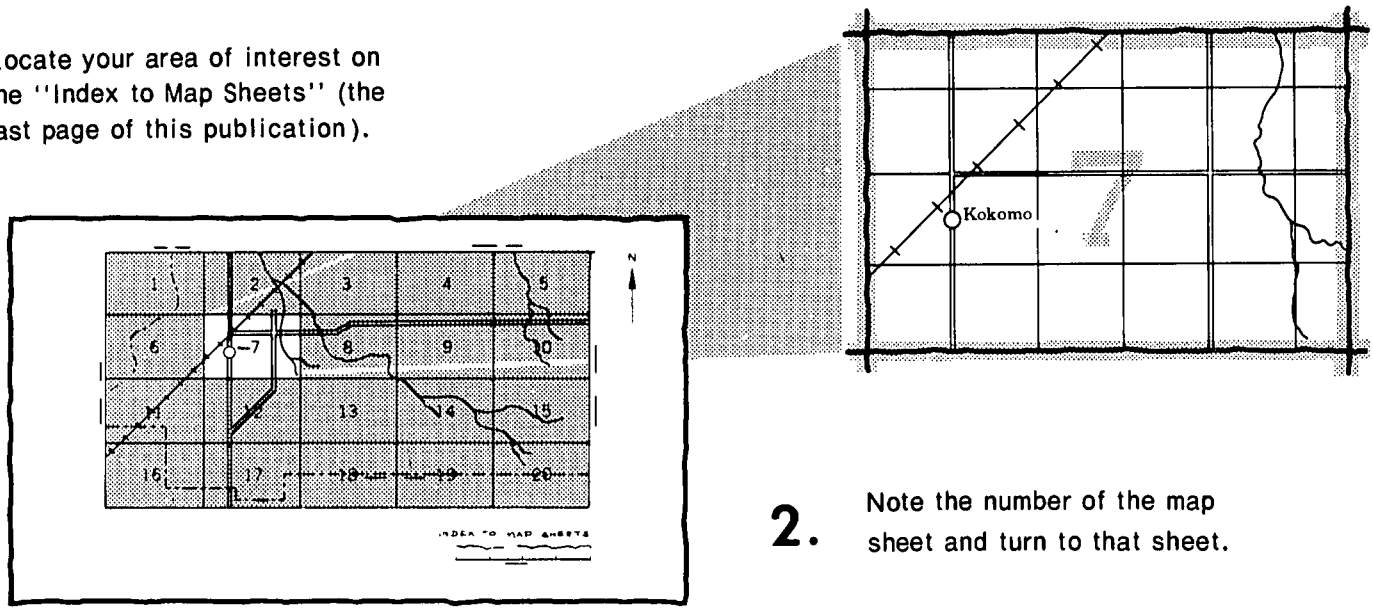

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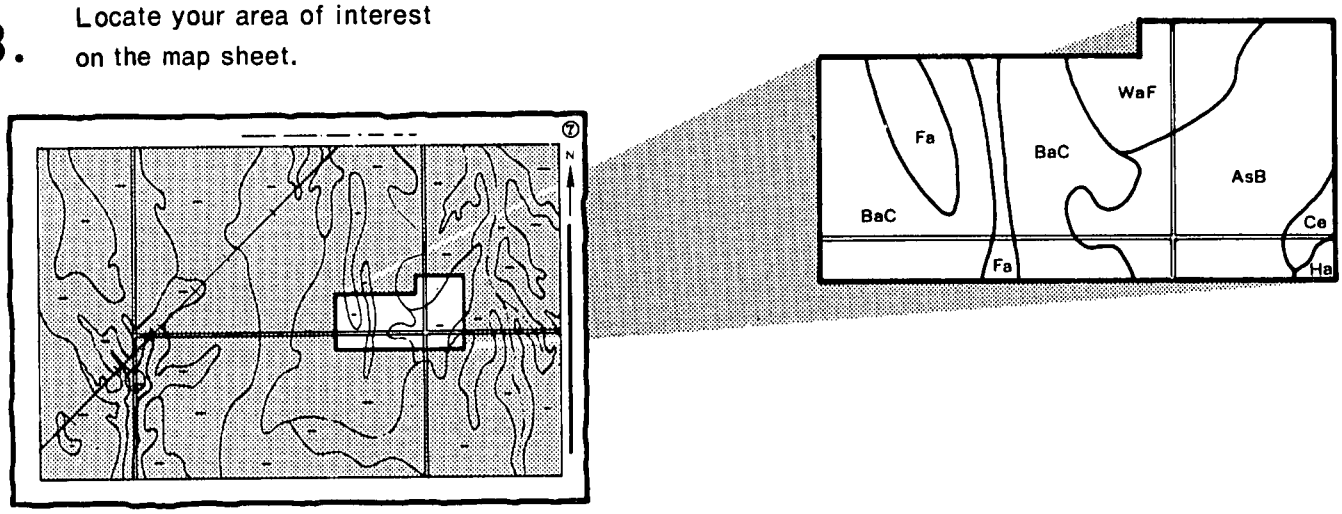

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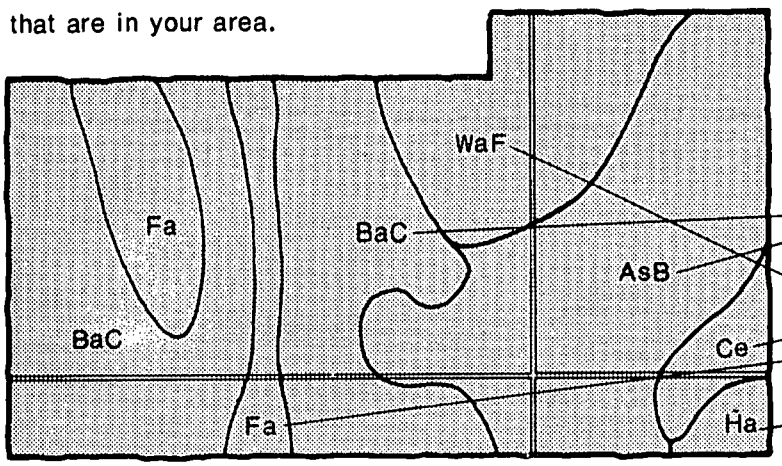

Symbols

AsB
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THIS SOIL SURVEY

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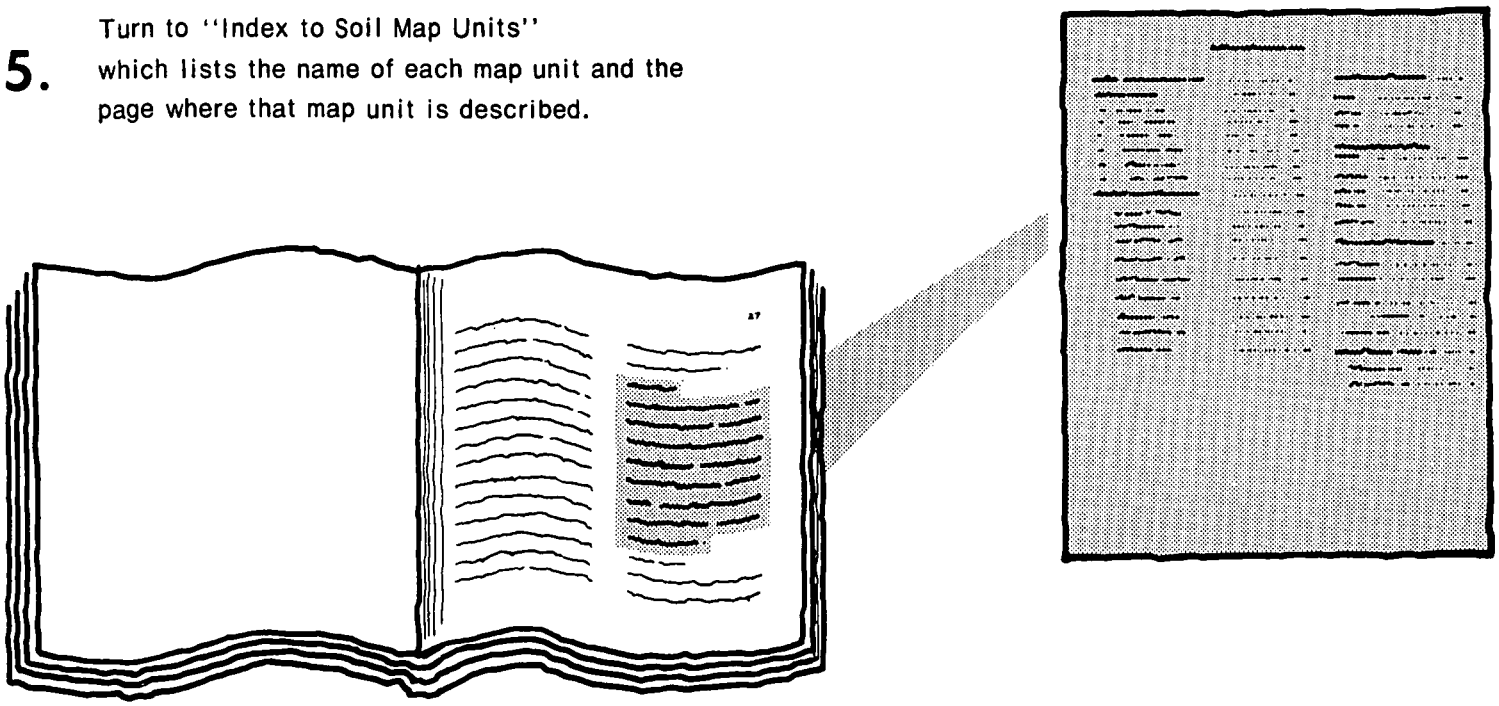

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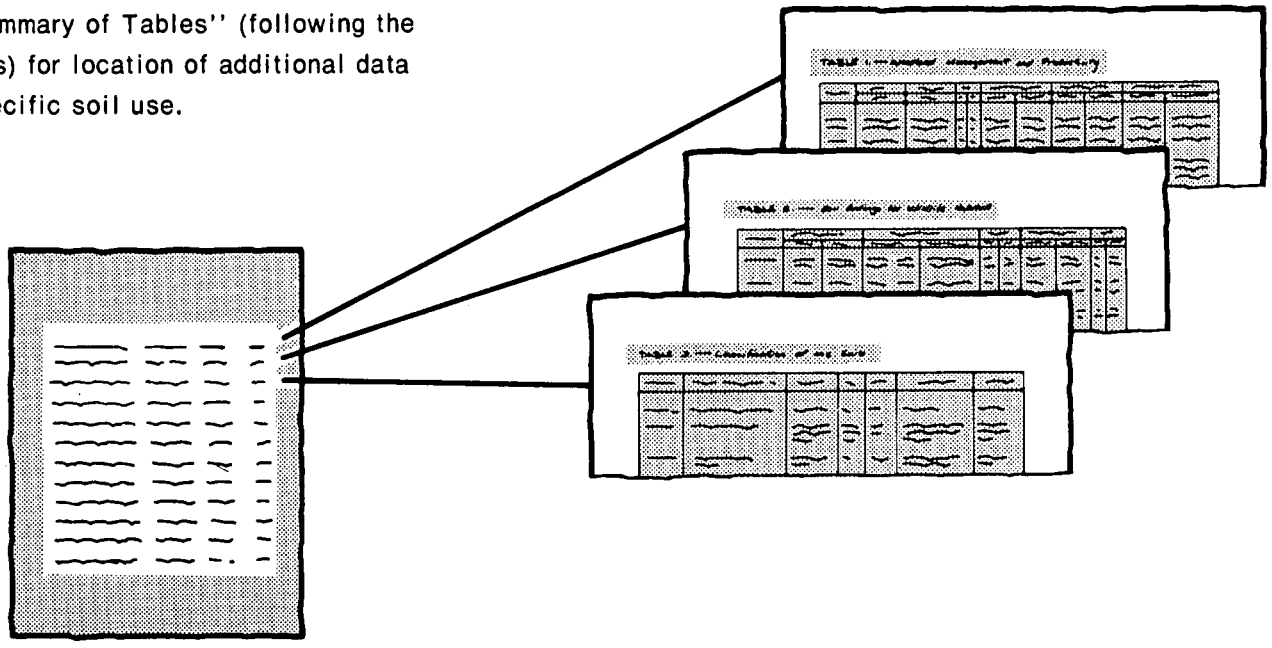


7. Consult "Contents" for parts of the publication that will meet your specific needs. This survey contains useful information for farmers or ranchers, foresters or agronomists; for planners, community decision makers, engineers, developers, builders, or homebuyers; for conservationists, recreationists,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

This 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 1974-78. Soil names and descriptions were approved in 1980. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1979. This survey was made cooperatively by the Soil Conservation Service, the Forest Service, the Bureau of Land Management, and the Utah Agricultural Experiment Station. It is part of the technical assistance furnished to the Rich Soil Conservation District.

Financial assistance was provided by the Bear Lake Regional Commission; State Department of Natural Resources, Division of State Lands and Forestry; State Soil Conservation Commission; Commissioners of Rich County; and Rich Soil Conservation District.

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

contents

Index to map units v
Summary of tables viii
Foreword xi
General nature of the survey area 1
How this survey was made 6
General soil map units 9
Broad land use considerations 17
Detailed soil map units 19
Map unit descriptions 19
Prime farmland 80
Use and management of the soils 81
Crops and pasture 81
Rangeland 83
Woodland management and productivity 84
Woodland understory vegetation 85
Recreation 85
Wildlife habitat 86
Engineering 88
Soil properties 93
Engineering index properties 93
Physical and chemical properties 94
Soil and water features 95
Classification of the soils 97
Soil series and their morphology 97
Formation of the soils 139
Parent material 139
Climate 140
Relief 140
Plant and animal life 140
Time 141
References 143
Glossary 145
Tables 153

soil series

Agassiz series 97
Alhark series 98
Ant Flat series 98
Baird Hollow series 99
Bear Lake series 100
Bequinn series 100
Bereniceton series 101
Bockston series 101
Bullnel series 102
Canburn series 102
Canburn Variant 103
Cloud Rim series 103
Cluff series 104
Condie series 104
Cowco series 105
Cutoff series 105
Dagan series 105
Dennot series 106
Despain series 107
Despain Variant 107
Duckree series 108
Ellett series 109
Ercan series 109
Etchen series 109
Falula series 110
Flygare series 111
Fontreen series 111
Foxol series 112
Gobine series 112
Gridge series 113
Guilder series 113
Hades series 114
Hawkins series 114
Highams series 115
Highams Variant 115
Hival series 116
Horrocks series 116
Hourglass series 116
Jebo series 117
Kamack series 118
Kearl series 118
Lakridge series 118
Lariat series 119
Lonjon series 119
Lucky Star series 120
Lundy series 120
Matheson series 121
McCarey series 121
Mirror Lake series 122
Mult series 122
Murphy series 123
Neponset series 123
Nevka series 123
Obray series 124
Pancheri series 125
Ramshorn series 125

Ramshorn Variant 125
Ranruff series 126
Rexmont series 126
Rich series 127
Richens series 127
Richville series 127
Saleratus series 128
Saleratus Variant 128
Sambrito series 129
Scout series 129
Searla series 130
Slinger series 130
Solak series 131
St. Marys series 131
Sumine series 132
Thatcher series 132
Vanni series 133
Vicking series 134
Wader series 134
Wader Variant 135
Woodpass series 135
Yeates Hollow series 136
Yeljack series 136
Zagg series 137
Zegro series 137

Issued July 1982

index to map units

AAD—Agassiz-Mult complex, 10 to 25 percent slopes 19
AAF—Agassiz-Mult complex, 25 to 60 percent slopes 20
ABF—Agassiz-Richville complex, 10 to 60 percent slopes 20
ACF—Agassiz-Rock outcrop complex, 25 to 60 percent slopes 21
ADD—Alhark loam, 6 to 15 percent slopes 22
ADE—Alhark loam, 15 to 30 percent slopes 22
AEC—Alhark silt loam, loamy substratum, 4 to 10 percent slopes 22
AFD—Ant Flat silt loam, dry, 10 to 25 percent slopes 23
BAD—Baird Hollow silt loam, 10 to 25 percent slopes 23
BB—Bear Lake silt loam 24
BC—Bear Lake silt loam, ponded 24
BD—Bear Lake silty clay loam, saline-alkali 24
BEF—Bequinn very gravelly loam, 30 to 50 percent slopes 25
BFB—Bereniceton silt loam, cool, 1 to 3 percent slopes 25
BGE—Bereniceton gravelly loam, cool, 15 to 25 percent slopes 25
BHA—Bockston loam, cool, 0 to 3 percent slopes 26
BHB—Bockston loam, cool, 3 to 6 percent slopes 26
BJC—Bullnel loam, 4 to 15 percent slopes 27
BJE—Bullnel loam, 15 to 30 percent slopes 27
CA—Canburn silt loam 28
CBD—Cloud Rim, dry-McCarey loams, 4 to 15 percent slopes 28
CCE—Cluff gravelly loam, 10 to 40 percent slopes 29
CDD—Condie gravelly loam, 6 to 25 percent slopes. 29
CDE—Condie gravelly loam, 25 to 40 percent slopes 29
CEA—Cowco loam, 0 to 3 percent slopes 30
CEB—Cowco loam, 3 to 6 percent slopes 30
CFA—Cowco silty clay loam, saline-alkali, 0 to 3 percent slopes 31
CGD—Cutoff gravelly loam, 6 to 25 percent slopes... 31
CGF—Cutoff gravelly loam, 25 to 60 percent slopes. 32
CHF—Cutoff-Falula complex, 4 to 60 percent slopes 32
DAF—Dagan gravelly loam, moist, 25 to 40 percent slopes 33
DBF—Dagan very stony loam, 40 to 70 percent slopes 33
DCF—Dagan gravelly silt loam, 25 to 40 percent slopes 33
DDF—Dagan-Rubble Land complex, 40 to 70 percent slopes 34
DEE—Dennot loam, 25 to 40 percent slopes 34
DFC—Dennot very gravelly loam, 4 to 15 percent slopes 35
DGF—Despain gravelly loam, 30 to 60 percent slopes 35
DHB—Despain Variant gravelly loam, 1 to 3 percent slopes 36
DJA—Duckree loam, 0 to 3 percent slopes 36
DKD—Duckree gravelly loam, 3 to 25 percent slopes 36
DLE—Duckree gravelly silt loam, 15 to 40 percent slopes 37
DMF—Duckree-St. Marys, dry association, 25 to 50 percent slopes 37
EAC—Ellett silt loam, 2 to 10 percent slopes 38
EAE—Ellett silt loam, 10 to 30 percent slopes 38
EBD—Ercan loam, 3 to 15 percent slopes 39
EBE—Ercan loam, 15 to 30 percent slopes 39
ECE—Etchen very cobbly loam, 25 to 40 percent slopes 39
FAE—Falula very gravelly loam, 4 to 25 percent slopes 40
FBC—Falula gravelly silt loam, 1 to 10 percent slopes 40
FCE—Falula-Kearl complex, 4 to 25 percent slopes.. 41
FDF—Flygare gravelly loam, 25 to 50 percent slopes 41
FEE—Fontreen-Rexmont, very shallow complex, 6 to 40 percent slopes 42
FFF—Foxol extremely stony sandy loam, 30 to 60 percent slopes 42
FGE—Foxol very stony loam, 10 to 40 percent slopes 43
GAD—Gobine silt loam, 1 to 10 percent slopes 43
GBE—Gridge-Rock outcrop complex, 25 to 40 percent slopes 44
GCE—Guilder loam, 15 to 25 percent slopes 44
HAB—Hades silt loam, 3 to 6 percent slopes 44
HBD—Hawkins silty clay loam, 6 to 25 percent slopes 45
HC—Hival silty clay loam 45
HDC—Horrocks gravelly loam, 6 to 10 percent slopes 46
HEF—Hourglass silt loam, 25 to 50 percent slopes... 46
JAE—Jebo very gravelly loam, 15 to 25 percent slopes 47

JAF—Jebo very gravelly loam, 25 to 40 percent slopes 47
KAF—Kamack loam, 30 to 60 percent slopes 48
KBD—Kearl loam, 4 to 15 percent slopes 48
KBE—Kearl loam, 15 to 25 percent slopes 48
KBF—Kearl loam, 25 to 40 percent slopes 49
KCD—Kearl-Richville, dry complex, 4 to 15 percent slopes 49
LAD—Lakridge silt loam, 5 to 10 percent slopes 50
LBC—Lariat fine sandy loam, 4 to 10 percent slopes 50
LCD—Lonjon silt loam, 2 to 10 percent slopes 50
LCE—Lonjon silt loam, 10 to 30 percent slopes 51
LDD—Lucky Star gravelly loam, 8 to 25 percent slopes 51
LDF—Lucky Star gravelly loam, 25 to 60 percent slopes 52
LEF—Lucky Star-Condie gravelly loams, 25 to 60 percent slopes 52
LFF—Lundy, dry-Rock outcrop complex, 25 to 60 percent slopes 53
MAA—Matheson sandy loam, wet, 0 to 2 percent slopes 53
MBE—Mirror Lake-Sambrito sandy loams, 10 to 30 percent slopes 54
MCD—Mult-Agassiz complex, 10 to 25 percent slopes 54
MDC—Murphy-Richville, dry complex, 4 to 8 percent slopes 54
MDE—Murphy-Richville, dry complex, 15 to 30 percent slopes 55
NAD—Neponset sandy loam, 6 to 10 percent slopes 56
NBA—Nevka loam 56
NCA—Nevka loam, wet 56
PAC—Pancheri silt loam, cool, 1 to 5 percent slopes 57
PAD—Pancheri silt loam, cool, 5 to 10 percent slopes 57
PAE—Pancheri silt loam, cool, 10 to 25 percent slopes 58
PAE2—Pancheri silt loam, cool, 10 to 20 percent slopes, eroded 58
PBF—Pancheri-Highams Variant-Rock outcrop complex, 6 to 50 percent slopes 59
PD—Pits-Dumps complex 59
RAD—Ramshorn gravelly loam, 8 to 15 percent slopes 59
RBD—Ramshorn Variant-Highams complex, 2 to 15 percent slopes 60
RBE—Ramshorn Variant-Highams complex, 15 to 40 percent slopes 60
RCG—Rexmont-Rock outcrop complex, 25 to 70 percent slopes 61
RD—Rich loam, wet 61
RE—Rich silt loam 62
RFD—Richens loam, 10 to 30 percent slopes 62
RGF—Richens-Agassiz complex, 25 to 60 percent slopes 62
RHC—Richville loam, dry, 4 to 8 percent slopes 63
RHD—Richville loam, dry, 8 to 15 percent slopes 63
SA—Saleratus loam 64
SB—Saleratus loam, saline-alkali 64
SC—Saleratus Variant-Canburn Variant complex 64
SDF—Sambrito sandy loam, 25 to 60 percent slopes 65
SEE—Scout very stony loam, 10 to 40 percent slopes 65
SFD—Searla very gravelly silt loam, 8 to 25 percent slopes 66
SGF—Slinger gravelly loam, 25 to 40 percent slopes 66
SHF—Solak gravelly loam, 10 to 50 percent slopes .. 67
SJF—Solak gravelly loam, dry, 25 to 60 percent slopes 67
SKF—Solak-Ranruff-Rock outcrop complex, 30 to 60 percent slopes 67
SLE—St. Marys loam, 10 to 40 percent slopes 68
SME—St. Marys-Yeljack, north loams, 10 to 40 percent slopes 68
SNF—Sumine stony loam, 25 to 50 percent slopes... 69
TAB—Thatcher silt loam, 1 to 5 percent slopes 69
TAD—Thatcher silt loam, 5 to 10 percent slopes 70
TAE—Thatcher silt loam, 10 to 20 percent slopes 70
TBA—Thatcher silt loam, warm, 1 to 3 percent slopes 70
TBB—Thatcher silt loam, warm, 3 to 6 percent slopes 71
TBC—Thatcher silt loam, warm, 6 to 10 percent slopes 71
TBD—Thatcher silt loam, warm, 10 to 25 percent slopes 72
VAE—Vanni loam, 10 to 30 percent slopes 72
VAF—Vanni loam, 30 to 50 percent slopes 73
VBF—Vanni very stony loam, 40 to 60 percent slopes 73
VCD—Vicking silt loam, dry, 4 to 15 percent slopes .. 74
WA—Wader loam 74
WB—Wader loam, saline-alkali 74

WC—Wader Variant gravelly loam 75
WDC—Woodpass loam, 2 to 8 percent slopes 75
YAE—Yeates Hollow gravelly loam, 25 to 40 percent slopes 76
YBD—Yeates Hollow-Obray complex, 6 to 25 percent slopes 76
YCD—Yeljack loam, 6 to 25 percent slopes 77
YDE—Yeljack loam, north, 10 to 30 percent slopes .. 77
YEE—Yeljack-Cluff complex, 10 to 40 percent slopes 78
ZAD—Zagg complex, 2 to 15 percent slopes 78
ZBC—Zegro silty clay loam, 2 to 5 percent slopes 79
ZCD—Zegro-Zagg complex, 2 to 15 percent slopes .. 79

summary of tables

Temperature and precipitation (table 1) 154

Acreage and proportionate extent of the soils (table 2) 155
Acres. Percent.

Capability classes and subclasses (table 3) 157
Total acreage. Major management concerns.

Rangeland productivity and characteristic plant communities (table 4) 158
Range site name. Total production. Characteristic vegetation. Composition.

Woodland management and productivity (table 5) 168
Ordination symbol. Management concerns. Potential productivity.

Woodland understory vegetation (table 6) 170
Total production. Characteristic vegetation. Composition.

Recreational development (table 7) 173
Camp areas. Picnic areas. Playgrounds. Paths and trails. Golf fairways.

Wildlife habitat potentials (table 8) 183
Potential for habitat elements. Potential as habitat for—Openland wildlife, Woodland wildlife, Wetland wildlife, Rangeland wildlife.

Building site development (table 9) 190
Shallow excavations. Dwellings without basements. Dwellings with basements. Small commercial buildings. Local roads and streets. Lawns and landscaping.

Sanitary facilities (table 10) 200
Septic tank absorption fields. Sewage lagoon areas. Trench sanitary landfill. Area sanitary landfill. Daily cover for landfill.

Construction materials (table 11) 210
Roadfill. Sand. Gravel. Topsoil.

Water management (table 12) 220
Limitations for—Pond reservoir areas; Embankments, dikes, and levees. Features affecting—Drainage, Irrigation, Terraces and diversions, Grassed waterways.

Engineering index properties (table 13) 229
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 soils (table 14) 249
Depth. Clay. Moist bulk density. Permeability. Available water capacity. Soil reaction. Salinity. Shrink-swell potential. Erosion factors. Wind erodibility group. Organic matter.
Water features (table 15) 260
Hydrologic group. Flooding. High water table.
Soil features (table 16) 266
Bedrock. Cemented pan. Potential frost action. Risk of corrosion.
Classification of the soils (table 17) 272
Family or higher taxonomic class.

foreword

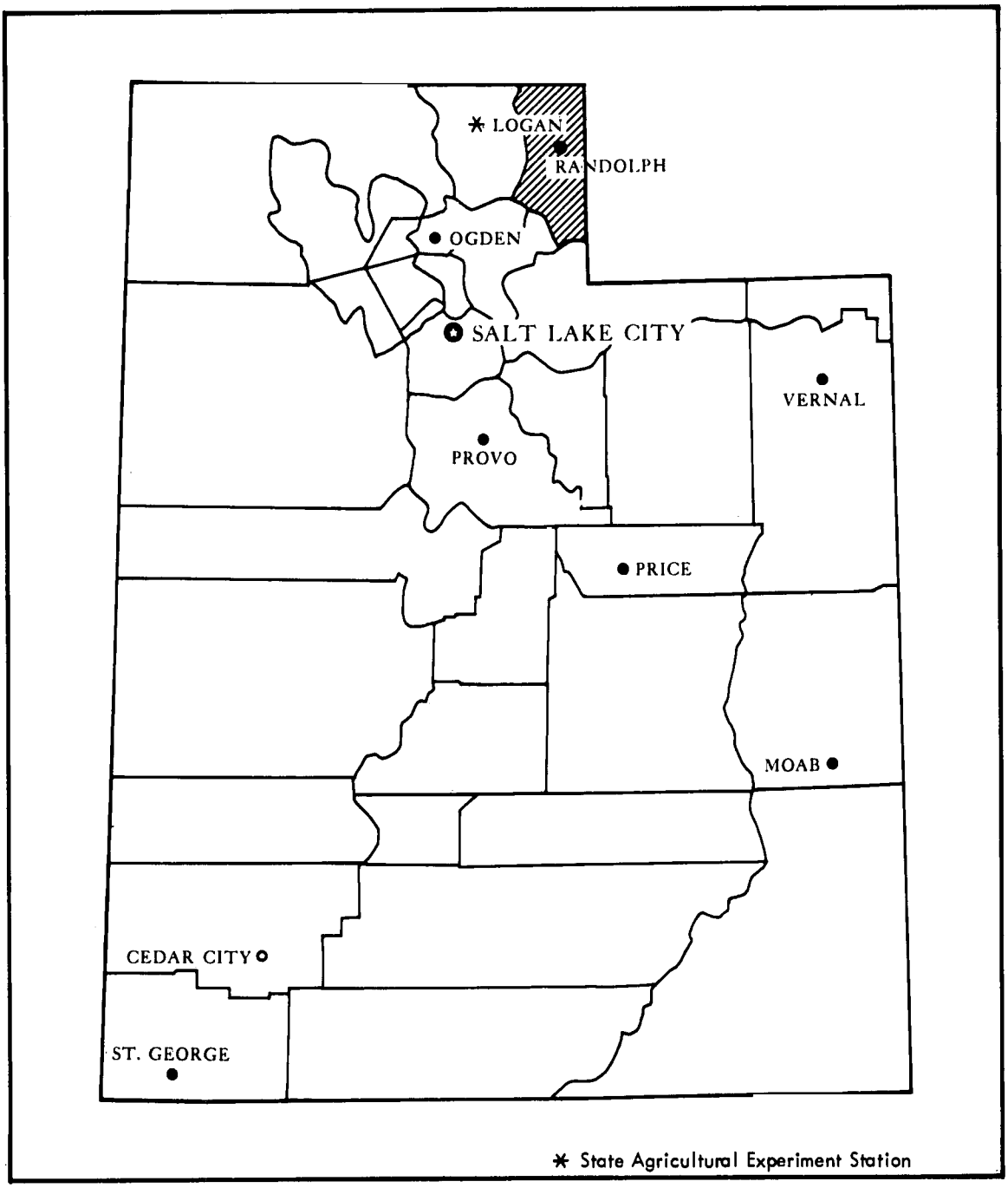
This soil survey contains information that can be used in land-planning programs in Rich County. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact of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

George D. McMillan
State Conservationist
Soil Conservation Service



Location of Rich County in Utah.

soil survey of
Rich County, Utah

By LuDene B. Campbell and Celestine A. Lacey,
Soil Conservation Service

Fieldwork by LuDene B. Campbell, Alan L. Harkness, Alex Hitt, Celestine A. Lacey, Rick Lawton, Joao Queiroz, Thomas J. Rice, Jr., Hal K. Swenson, and Darryl S. Trickler, Soil Conservation Service; Paul Winkelaar, Forest Service; and Dean Davidson and Timothy E. Sullivan, Utah Agricultural Experiment Station

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

RICH COUNTY is in northeastern Utah. The county has a total land area of 654,720 acres, or about 1,023 square miles, and a total water area of 35,145 acres, or about 55 square miles. Elevation ranges from 5,924 feet at Bear Lake to 9,148 feet at Monte Cristo Peak. The population of the county is about 1,615. Randolph, the county seat, has a population of about 500.

Rich County is used mainly for agriculture. About 11,600 acres is used as nonirrigated cropland, 48,400 acres as irrigated cropland, hayland, and pastureland, and 594,720 acres as rangeland and forest land.

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

general nature of the survey area

This section briefly discusses the history and development; physiography, drainage, and relief; natural resources; water supply; agriculture; and climate of the survey area.

history and development

The early inhabitants of Rich County were the Bannock and Shoshone Indians. Among the first white men to see Bear Lake Valley was a fur trapper named Joseph Miller. He and a small group of trappers became separated from the Wilson-Price-Hunt expedition and entered the valley in 1811-12. Miller was followed by Donald MacKensie and his men from the Northwest Fur Company in 1818.

By 1822 the Rocky Mountain Fur Company began to use the southern end of the lake as a rendezvous point. Jim Bridger, Jedidiah Smith, William Sublette, and Etienne Provost were among the famous mountain men in this company. As many as 10,000 Indians, fur trappers, and traders were present during these rendezvous. The fur trading industry was coming to a close by 1841, when the first wagon trains began rolling through the valley.

In September of 1863, Charles C. Rich led the first group of settlers into the Bear Lake Basin (*5*). They first settled in what is now Idaho, but several years later they moved to the southern end of the lake, near the present towns of Meadowville and Laketown.

By 1870 Randolph and Woodruff had become the first permanent settlements in Bear River Valley. In 1872 Randolph, the largest community, was made the county seat.

Agriculture has long been the mainstay of the economy of Rich County. Corn, wheat, oats, and barley were planted by the early settlers; however, the short growing season and low precipitation limited the success of most crops. Berries were and still are viable crops in Bear Lake Valley.

Native and improved grasses grow well in the valleys and surrounding foothills and mountains. The importance of the grasses as a source of feed for livestock was recognized early in the settlement of the county. Thus, the raising of cattle and sheep has become the most important segment of the economy of the county.

physiography, drainage, and relief

Rich County is in the southwestern part of the Middle Rocky Mountain physiographic province. The county has five distinct physiographic areas. They include parts of Bear River Plateau, Bear River Basin, Bear River Valley, the Crawford Mountains, and the Bear River Range.

Bear River Plateau is the largest physiographic area. It is bordered by Bear Lake Basin on the west and Bear River Valley on the east. The area is characterized by nearly level to steep uplands and foothills. Many small drainageways dissect the area. The rock outcroppings and underlying bedrock in the area are chiefly sandstone and limestone of the Wasatch Formation (*7*). Elevation ranges from 6,500 to 8,700 feet.

Bear Lake Basin is in the northwestern corner of the county. Bear Lake is in the center of the basin. The lake extends northward from Laketown into Idaho; slightly more than half of the 19-mile length of the lake is in Utah. The lake is 7 1/2 miles wide at the state line and is more than 200 feet deep. The surrounding valleys and steep foothills and mountains resulted from recurrent faulting (*6*).

Bear River Valley is along the eastern boundary of the county. The major drainageway in the valley is the Bear River. It enters the county on the east and flows northward through the valley. This area is characterized by a nearly level flood plain and adjoining terraces and foothills. Most of the flood plain is under irrigation.

The Crawford Mountains are between the Bear River flood plain and the Utah-Wyoming state line. The area consists of steep mountains composed of folded and faulted Paleozoic strata. Limestone forms a wall along the western front of the mountains.

The Bear River Range, along the western edge of the county, is the northern extension of the Wasatch Range. This mountain range is the boundary between Cache and Rich Counties, and it provides drainage into Bear River Valley and Bear Lake Basin. Most of the range in Rich County is capped by sandstone or conglomerate of the Wasatch Formation. Streams dissecting the mountainsides have cut through the cap rock and exposed tilted layers of sandstone and limestone.

Rich County can be divided into two main surface drainage regions. About 77 percent of the county drains into the Bear River system (*3*). The headwaters of the Bear River begin on the north slope of the Uinta Mountains in Summit County. The river enters Rich County on the east from Wyoming and flows northward through Bear River Valley. Many small tributaries flow into the river. The most important of these are Saleratus, Woodruff, Randolph, and Big Creeks. About 12 miles north of Randolph, the Bear River flows back into Wyoming and then into Idaho.

The remaining 23 percent of the county drains into the Bear Lake Basin. The major tributaries in this area are Swan and Big Creeks and North Eden and South Eden Canyons.

natural resources

Soil, water, and minerals are important natural resources in Rich County. Soil and water are the most important and widely used resources. They are renewable resources, and with careful use and management their value can be maintained or improved.

The Bear River and its tributaries are the main source of water for irrigation. Bear Lake and numerous reservoirs provide power, recreation, stock water, flood control, and irrigation water. Water for domestic use in towns is supplied mainly from springs.

The mineral resources of the county include deposits of phosphate, sand and gravel, limestone, quartzite, and oil. Large deposits of phosphate are in the northern and eastern parts of the county (*3*). These deposits have been partially mined; however, phosphate mining has decreased in recent years because of the depressed market price.

Sand and gravel deposits are abundant in Bear Lake Basin and Bear River Valley. These deposits are used mainly for construction and maintenance of roads.

Large quantities of quartzite and limestone are available in the county. Small amounts of sandstone from the east side of Bear Lake are used for construction of residential and commercial buildings.

Oil leasing and drilling activities have increased in recent years. To date, most of the drilling has been exploratory.

water supply

Bear River and Bear Lake are the main sources of surface water in Rich County. They are fed by springs, by runoff and snowmelt from the foothills and mountains, and by ground water discharge.

The rainfall in the county is not adequate to produce maximum crop yields; therefore, supplemental irrigation

is desirable. The Bear River and small streams are the main sources of water for irrigation.

There are 29 irrigation companies that serve farmers and ranchers in the county. The four major irrigation companies, serving about 50 percent of the county, divert water from the Bear River (*3*).

There are 17 lakes and reservoirs in the county that are used for irrigation and recreation and as a source of stock water. They contain a total of about 727,718 acre-feet of water. Bear Lake makes up 97 percent of this total. Neponset, Woodruff Creek, and Birch Creek Reservoirs make up most of the remaining 3 percent. Bear Lake contributes little irrigation water to the county; however, it is a major recreational attraction.

The ground water recharge in the county is mainly from precipitation and excess irrigation water. In the Bear River Valley, the principal water-bearing deposits are limited to the flood plain of the Bear River. In the Bear Lake Basin, ground water yields are low because the aquifer is thin and the permeability of the valley fill is low. Development of ground water resources has been limited in the county (*4*).

The water supply for towns is derived mainly from springs. The present water supply is adequate to meet the current needs of most towns; however, additional water will be needed to stimulate economic growth and accommodate recreational needs in the future.

agriculture

About 93 percent of the total land area in the county is used for agriculture. About 90 percent of all the agricultural land is used by the livestock industry, and the remaining 10 percent is used for crops.

Livestock raising is the most important agricultural enterprise in the county, and it is responsible for maintaining the economic stability of the county. Although climatic factors limit the commercial production of crops, native and improved grasses grow well. They provide forage for both cattle and sheep. This forage, combined with supplemental hay and grain in winter, sustains the livestock industry.

The trend in the county, as in most counties in Utah, is toward fewer and larger farms and ranches. Rapid increases in labor costs and other operating costs have forced the consolidation of small, marginally efficient agricultural operations into larger, more mechanized and efficient farms and ranches.

climate

By E. Arlo Richardson, state climatologist, Utah Department of Agriculture.

The climate of the survey area is markedly influenced by the topography. Rich County consists primarily of a high mountain valley running generally north and south and surrounded in almost all directions by mountains that extend several thousand feet above the valley floor. Bear Lake is the lowest part of the valley, and it is surrounded by mountains except for the small opening through which the outlet from the lake flows.

The climate in the county is continental. It is characterized by low humidity, generally low precipitation on the valley bottoms, and wide ranges in temperature. Abundant sunshine occurs during the growing season, but it is restricted during winter when strong temperature inversions develop.

The high mountains are primarily along the western side of the county. These mountains tend to produce a rain shadow effect for winter storms. This limits precipitation in the lower valleys to only 6 to 8 inches during October to April (fig. 1). Most of the precipitation in winter is associated with Pacific storm fronts that move across the northern part of Utah from the west. The precipitation during October to April at higher elevations is between 30 and 40 inches. By contrast, the precipitation during the growing season, May to September, is only about 5 inches in the lower valleys and 10 inches at higher elevations (fig. 2).

Most of the precipitation in winter falls as snow. The seasonal accumulation is quite variable, ranging from only 40 inches on the lower valley bottoms to nearly 200 inches at the higher elevations on the west side of the county. The normal annual precipitation ranges from a little less than 10 inches in the driest part of the county to nearly 50 inches at higher elevations (fig. 3).

The temperature in the county also varies widely. July, the warmest month, has an average maximum temperature of 81.2 degrees F at Woodruff. January, the coldest month, has an average minimum temperature of 1.2 degrees. The extreme temperatures at Woodruff range from a maximum of 96 degrees to a minimum of 50 degrees below zero. The largest average daily variation, 40.1 degrees, occurs during September at Woodruff. The smallest daily variation, 25.5 degrees, occurs during March. Table 1 gives a summary of the climate at the Laketown and Woodruff reporting stations.

Frost has been reported throughout the year in almost all parts of the county. The average length of the freeze-free season is limited by the formation of intense temperature inversions during most of the year (fig. 4). Since the valley generally is above an elevation of 6,000 feet, there is less air to retard the outgoing radiation. As a result, cold air flows down the slopes of the surrounding mountains and collects at the bottom of the valley. The average length of the freeze-free season ranges from only 55 days on the valley bottoms of the county to nearly 120 days at intermediate elevations near the top of the inversion. Above the inversion, near the top of the mountains, the length of the freeze-free season drops to nearly 70 days. The probability that the last and first temperatures of 16, 20, 24, 28, and 32 degrees will occur at Laketown after or before particular dates is shown in figures 5 and 6.

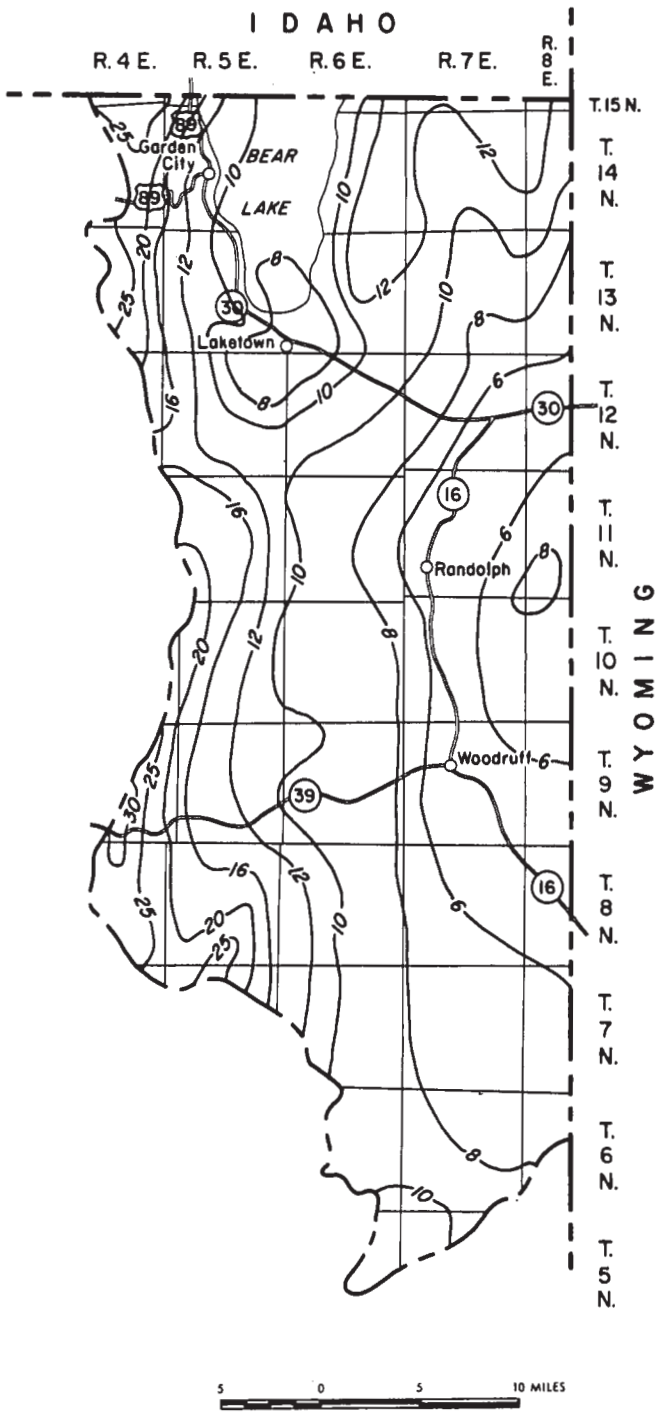


Figure 1.—Normal precipitation during October to April in inches.

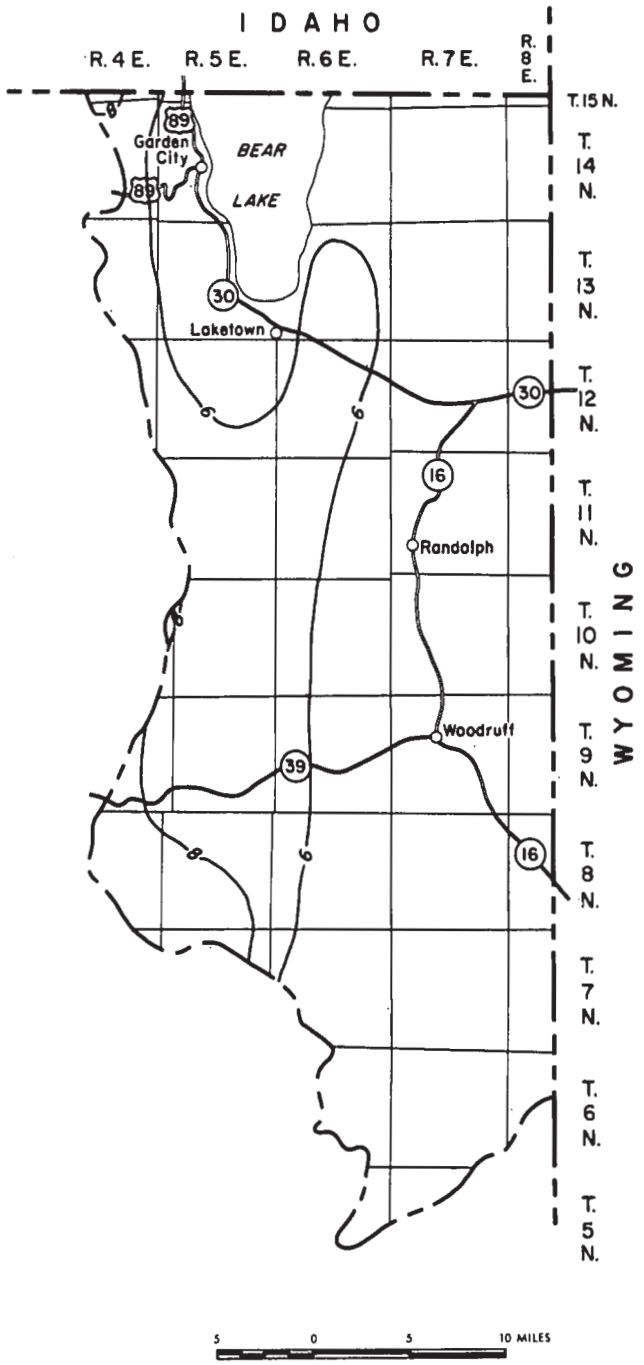


Figure 2.—Normal precipitation during May to September in inches.

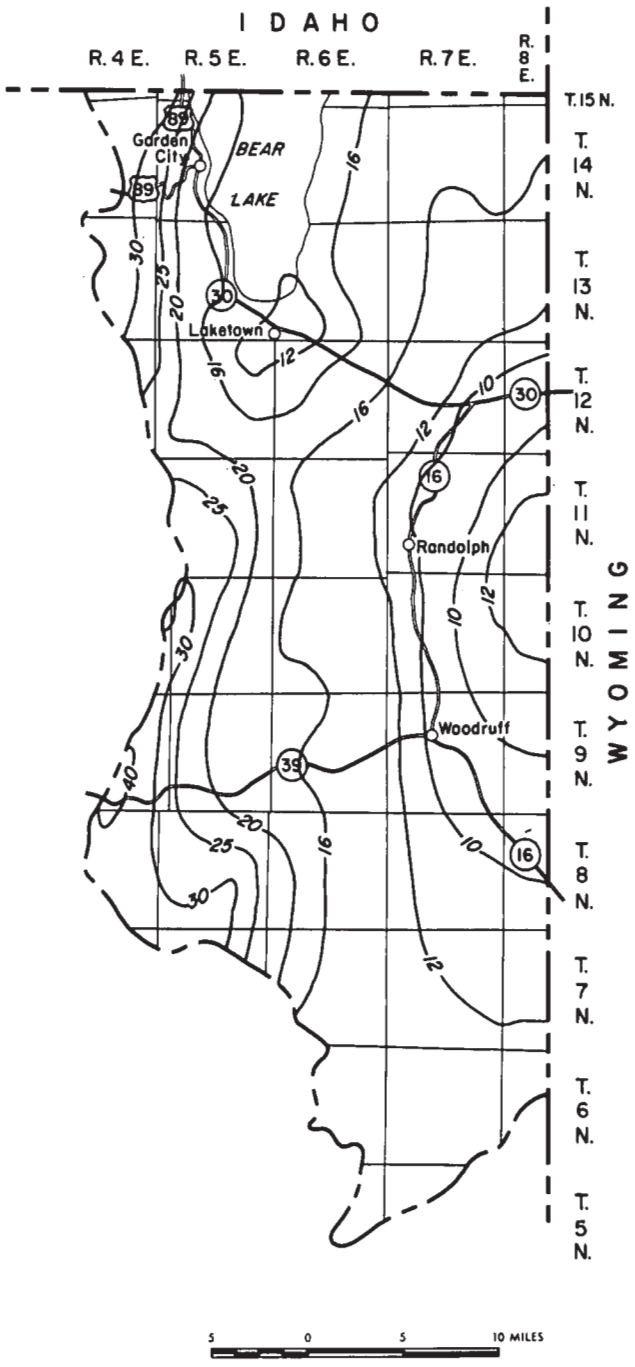


Figure 3.—Normal annual precipitation in inches.

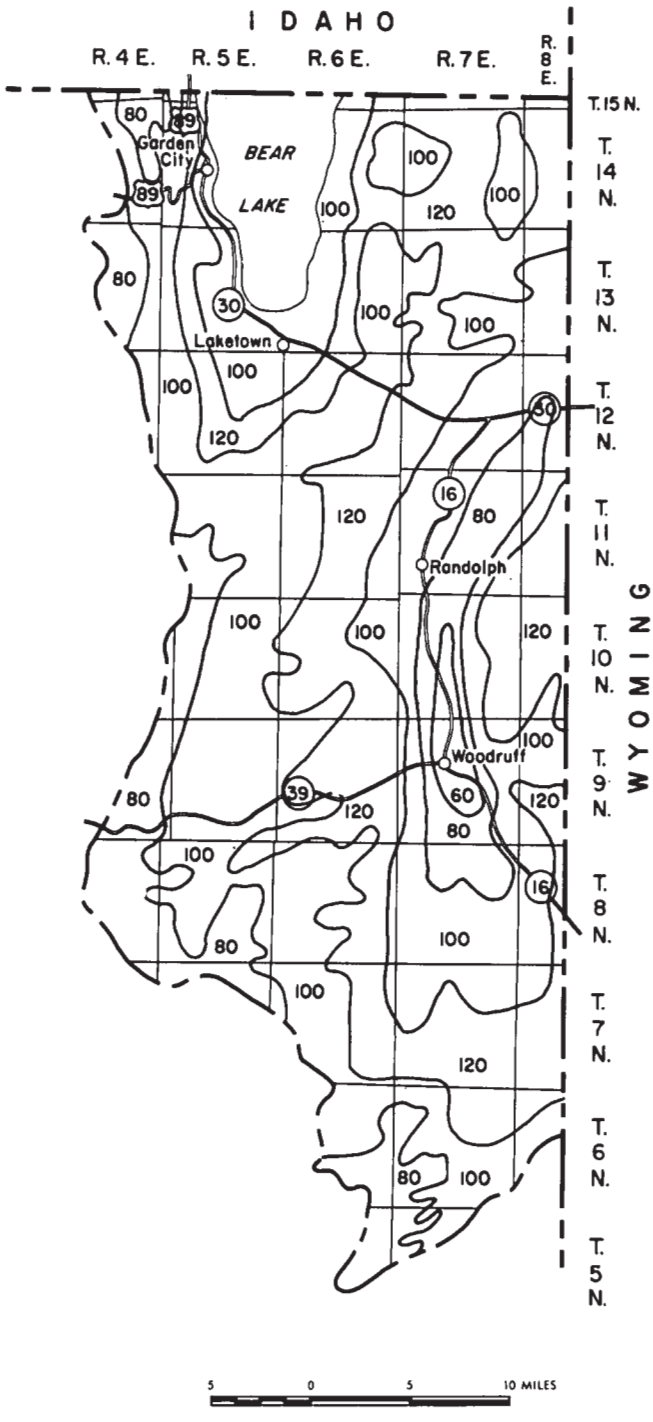


Figure 4.—Average length of freeze-free season in days.

The intense inversion also accounts for some extremely cold temperatures in winter. The coldest temperature, 50 degrees below zero, was recorded at Woodruff in February of 1899. The warmest temperature on record at Woodruff was 96 degrees in July of 1931. The maximum temperature recorded at Laketown was 98 degrees in 1940.

While no information on pan evaporation is available for the entire county, estimates of the normal monthly evaporation were made at Laketown during the period of maximum evaporation from May to October. According to these estimates, pan evaporation is 6.4 inches in May, 7.4 inches in June, 8.0 inches in July, 6.4 inches in August, 4.9 inches in September, and 3.2 inches in October. The total for these months is 36.3 inches. The evaporation ranges from about 40 inches near the top of the inversion to about 25 inches at the higher elevations.

No official data on wind velocity are available, but the topographic influences in the county are strong. During winter, the strong inversion that develops in the lower valleys reduces the average windspeed to about 6 miles per hour. During summer, winds of 9 to 10 miles per hour can be expected. Near the top of the mountains and over the mountain ridges, the windspeed is slightly higher, especially during winter.

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

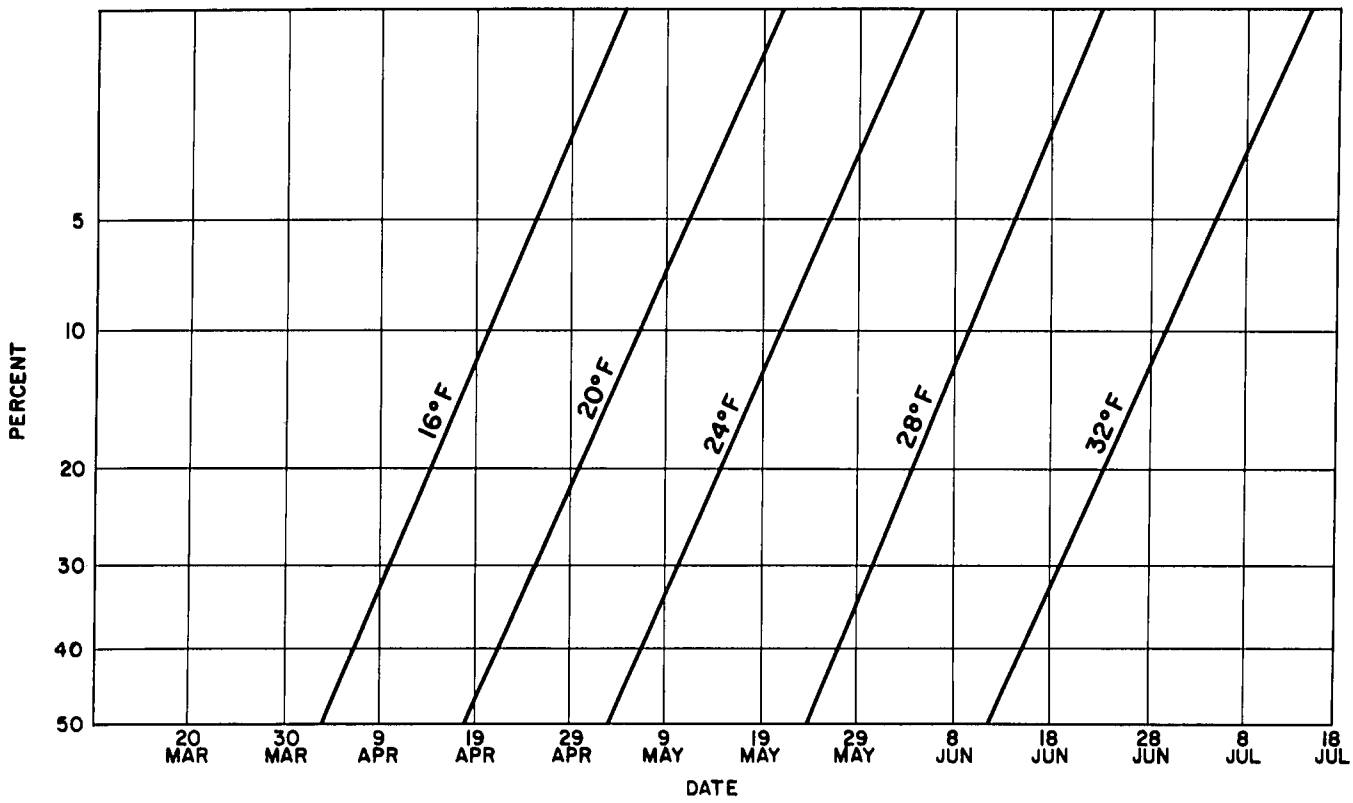


Figure 5.—Probability in percent that the last temperature of 16, 20, 24, 28, or 32 degrees will occur at Laketown after the dates indicated.

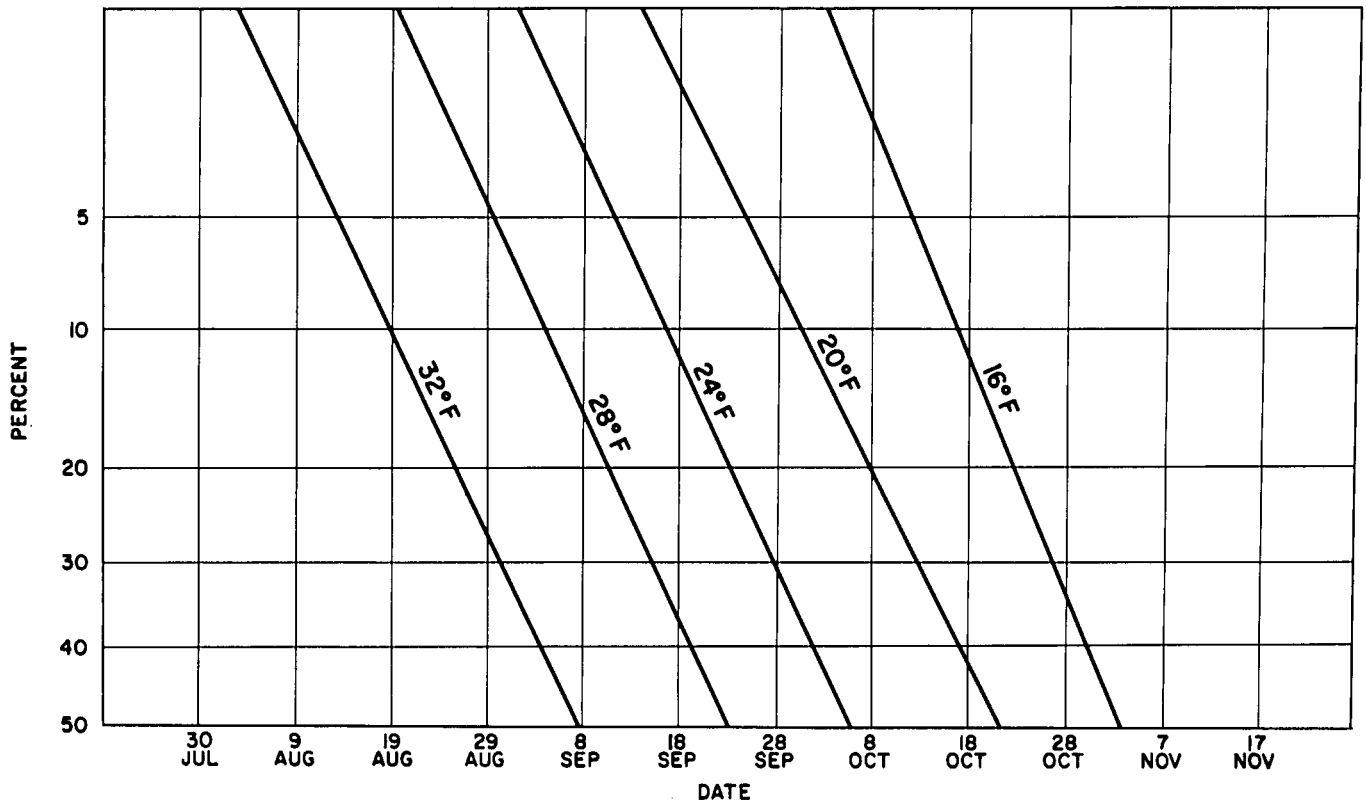


Figure 6.—Probability in percent that the first temperature of 32, 28, 24, 20, or 16 degrees will occur at Laketown before the dates indicated.

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 several of 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 12 map units in this survey have been grouped into five general kinds of landscape for broad interpretive purposes. Each of the broad groups and the map units in each group are described in the following pages.

very deep soils on stream terraces, alluvial fans, and flood plains

This group consists of three map units. It makes up about 12 percent of the survey area. The soils in this group are nearly level to sloping. The vegetation in areas not cultivated is mainly grasses and shrubs. Elevation is 5,930 to 6,500 feet. The average annual precipitation is about 9 to 14 inches, the mean annual air temperature is 38 to 44 degrees F, and the average freeze-free season is 55 to 90 days.

The soils in this group are very deep and very poorly drained, poorly drained, well drained, and somewhat excessively drained. They formed in mixed alluvium.

This group is used mainly as rangeland and for irrigated hay and pasture. It is also used as homesites and for wildlife habitat.

1. Bear Lake-Saleratus-Wader

Very deep, very poorly drained and poorly drained, nearly level to gently sloping soils; on flood plains

This map unit is in the north-central and eastern parts of the survey area. Slope is 0 to 2 percent. The potential vegetation in areas not cultivated is tufted hairgrass, sedges, cattails, and Baltic rush. Elevation is 5,930 to 6,430 feet. The average annual precipitation is about 9 to 14 inches, the mean annual air temperature is 38 to 44 degrees F, and the average freeze-free season is 55 to 90 days.

This unit makes up about 7 percent of the survey area. It is about 35 percent Bear Lake soils, 15 percent Saleratus soils, 15 percent Wader soils, and 10 percent Nevka soils. The remaining 25 percent is components of minor extent.

The soils in this unit formed in mixed alluvium.

Bear Lake soils are very poorly drained. They have a surface layer of silt loam. Below this is strongly calcareous silty clay loam.

Saleratus soils are poorly drained. They have a surface layer of loam. Below this are stratified loam, silt loam, and silty clay loam.

Wader soils are poorly drained. They have a surface layer of loam. Below this are stratified fine sandy loam, loam, and sand.

Nevka soils are poorly drained. They have a surface layer of loam. Below this is strongly calcareous loam over sand.

Of minor extent in this unit are Wader Variant and Canburn soils on flood plains, Hival soils on the Saleratus Creek flood plain, and Canburn Variant and Saleratus Variant soils on the shore of Bear Lake.

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

2. Rich-Saleratus-Cowco

Very deep, well drained, somewhat poorly drained and poorly drained, nearly level to gently sloping soils; on flood plains and alluvial fans

This map unit is in the eastern part of the survey area. Slope is 0 to 3 percent. The potential vegetation in areas not cultivated is alkali sacaton, saltgrass, basin wildrye, and alkali bluegrass. Elevation is 6,200 to 6,430 feet. The average annual precipitation is about 9 to 11 inches, the mean annual air temperature is 38 to 42 degrees F, and the average freeze-free season is 55 to 65 days.

This unit makes up about 2 percent of the survey area. It is about 30 percent Rich soils; 20 percent Saleratus soils; 20 percent Cowco soils; and 15 percent Nevka soils. The remaining 15 percent is components of minor extent.

Rich soils are on flood plains. These soils are very deep and somewhat poorly drained. They formed in mixed alluvium. The surface layer is silt loam. The subsoil is salt-affected clay.

Saleratus soils are on flood plains. These soils are very deep and poorly drained. They formed in mixed alluvium. The surface layer is loam. Below this is silty clay loam. These soils are salt- and alkali-affected.

Cowco soils are on flood plains and alluvial fans. These soils are very deep and well drained. They formed in mixed alluvium. The Cowco soils are silty clay loam throughout. They are salt- and alkali-affected.

Nevka soils are on flood plains. These soils are very deep and poorly drained. They formed in alluvium derived from a variety of geologic material. The Nevka soils are dominantly loam throughout. They are salt- and alkali-affected.

Of minor extent in this unit are poorly drained Wader soils, Bear Lake soils, and somewhat poorly drained Matheson soils.

Most areas of this unit are used as rangeland. A few areas are used for irrigated hay and pasture. Salt- and alkali-tolerant plants are best suited to the soils in this unit.

3. Cowco-Bockston

Very deep, well drained, nearly level to sloping soils; on alluvial fans, flood plains, and stream terraces

This map unit is in the eastern part of the survey area. Slope is 0 to 6 percent. The potential vegetation in areas not cultivated is bluebunch wheatgrass, needleandthread, and big sagebrush. Elevation is 6,200 to 6,500 feet. The average annual precipitation is about 9 to 11 inches, the mean annual air temperature is 38 to 42 degrees F, and the average freeze-free season is 55 to 65 days.

This unit makes up about 3 percent of the survey area. It is about 70 percent Cowco soils and 25 percent Bockston soils. The remaining 5 percent is components of minor extent.

Cowco soils are on flood plains and alluvial fans. These soils are very deep and well drained. They formed in mixed alluvium. The surface layer is loam. Below this are stratified loam and silty clay loam.

Bockston soils are on flood plains, alluvial fans, and stream terraces. These soils are very deep and well drained. They formed in mixed alluvium. The surface layer is loam. Below this is dominantly loam or fine sandy loam.

Of minor extent in this unit are Duckree soils on flood plains and stream terraces.

This unit is used mainly for irrigated crops and pasture. It is also used as rangeland and homesites.

This unit is well suited to use as homesites. Some areas of the unit that are near perennial streams have a water table at a depth of 5 to 6 feet.

moderately deep to very deep soils on foothills, stream terraces, uplands, and alluvial fans

This group consists of two map units. It makes up about 25 percent of the survey area. The soils in this group are gently sloping to very steep. The vegetation in areas not cultivated is mainly grasses and shrubs. Elevation is 6,200 to 7,400 feet. The average annual precipitation is about 9 to 14 inches, the mean annual air temperature is 37 to 44 degrees F, and the average freeze-free season is 55 to 75 days.

The soils in this group are moderately deep to very deep and are well drained and somewhat excessively drained. They formed in loess, alluvium, colluvium, and residuum derived from a wide variety of geologic material.

Most areas of this group are used as rangeland and for wildlife habitat. A few areas are used as homesites and irrigated cropland.

4. Pancheri-Woodpass-Alhark

Deep and very deep, well drained, gently sloping to very steep soils; on alluvial fans, foothills, and uplands

This map unit is in the eastern half of the survey area. Slope is 1 to 50 percent. The potential vegetation in areas not cultivated is bluebunch wheatgrass, needleandthread, and big sagebrush. Elevation is 6,200 to 7,200 feet. The average annual precipitation is about 9 to 13 inches, the mean annual air temperature is 38 to 42 degrees F, and the average freeze-free season is 55 to 70 days.

This unit makes up about 18 percent of the survey area. It is about 40 percent Pancheri soils, 15 percent Woodpass soils, 10 percent Alhark soils, and 10 percent Zagg soils. The remaining 25 percent is components of minor extent (fig. 7).

Pancheri soils are on foothills. These soils are very deep and well drained. They formed in loess. The soils are silt loam throughout the profile.

Woodpass soils are on alluvial fans and uplands. These soils are very deep and well drained. They formed in alluvium derived dominantly from sandstone and limestone. The soils are loam throughout the profile.

Alhark soils are on foothills. These soils are deep and well drained. They formed in colluvium and alluvium derived dominantly from sandstone. The surface layer is loam. Below this are loam and gravelly loam. Unweathered sandstone is at a depth of 42 inches.

Zagg soils are on rolling uplands. These soils are very deep and well drained. They formed in alluvium derived dominantly from siltstone and shale. The soils are clay loam throughout the profile.

Of minor extent in this unit are Lariat, Bereniceton, Neponset, and Zegro soils.

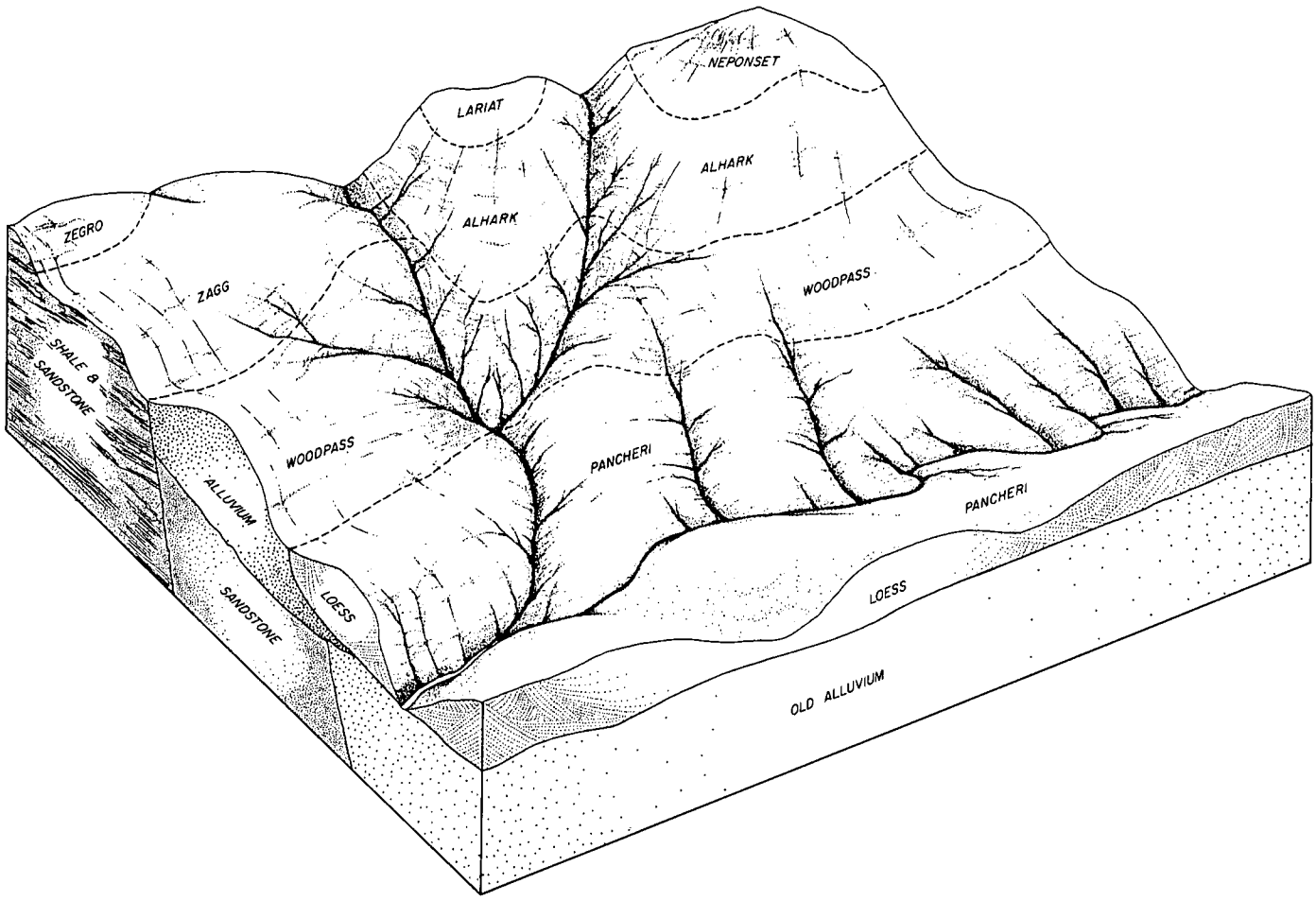


Figure 7.—Typical pattern of soils in general map unit 4.

Most areas of this unit are used as rangeland and for wildlife habitat. A few areas are used as irrigated cropland and homesites.

5. Duckree-Slinger

Moderately deep and very deep, somewhat excessively drained, gently sloping to very steep soils; on foothills and stream terraces

This map unit is in the eastern half of the survey area. Slope is 3 to 50 percent. The potential vegetation is mainly Indian ricegrass, bluebunch wheatgrass, and black sagebrush. Elevation is 6,300 to 7,400 feet. The average annual precipitation is about 9 to 14 inches, the average mean air temperature is 37 to 44 degrees F, and the average freeze-free season is 55 to 75 days.

This unit makes up about 7 percent of the survey area. It is about 60 percent Duckree soils and 30 percent Slinger soils. The remaining 10 percent is components of minor extent (fig. 8).

Duckree soils are on foothills and stream terraces. These soils are very deep and somewhat excessively drained. They formed in colluvium and alluvium derived dominantly from conglomerate composed of quartzite, chert, and sandstone. The surface layer is gravelly silt loam. Below this is dominantly very gravelly loam.

Slinger soils are on foothills. These soils are moderately deep and somewhat excessively drained. They formed in residuum and colluvium derived dominantly from sandstone. The surface layer is gravelly loam. Below this is very gravelly loam. Unweathered sandstone is at a depth of 23 inches.

Of minor extent in this unit are Bequinn soils and Solak soils that are dry. Bequinn soils are well drained and are on foothills and mountainsides. Solak soils are shallow and somewhat excessively drained. The largest area of these Solak soils is in the southern half of the Crawford Mountains.

This unit is used as rangeland and for wildlife habitat.

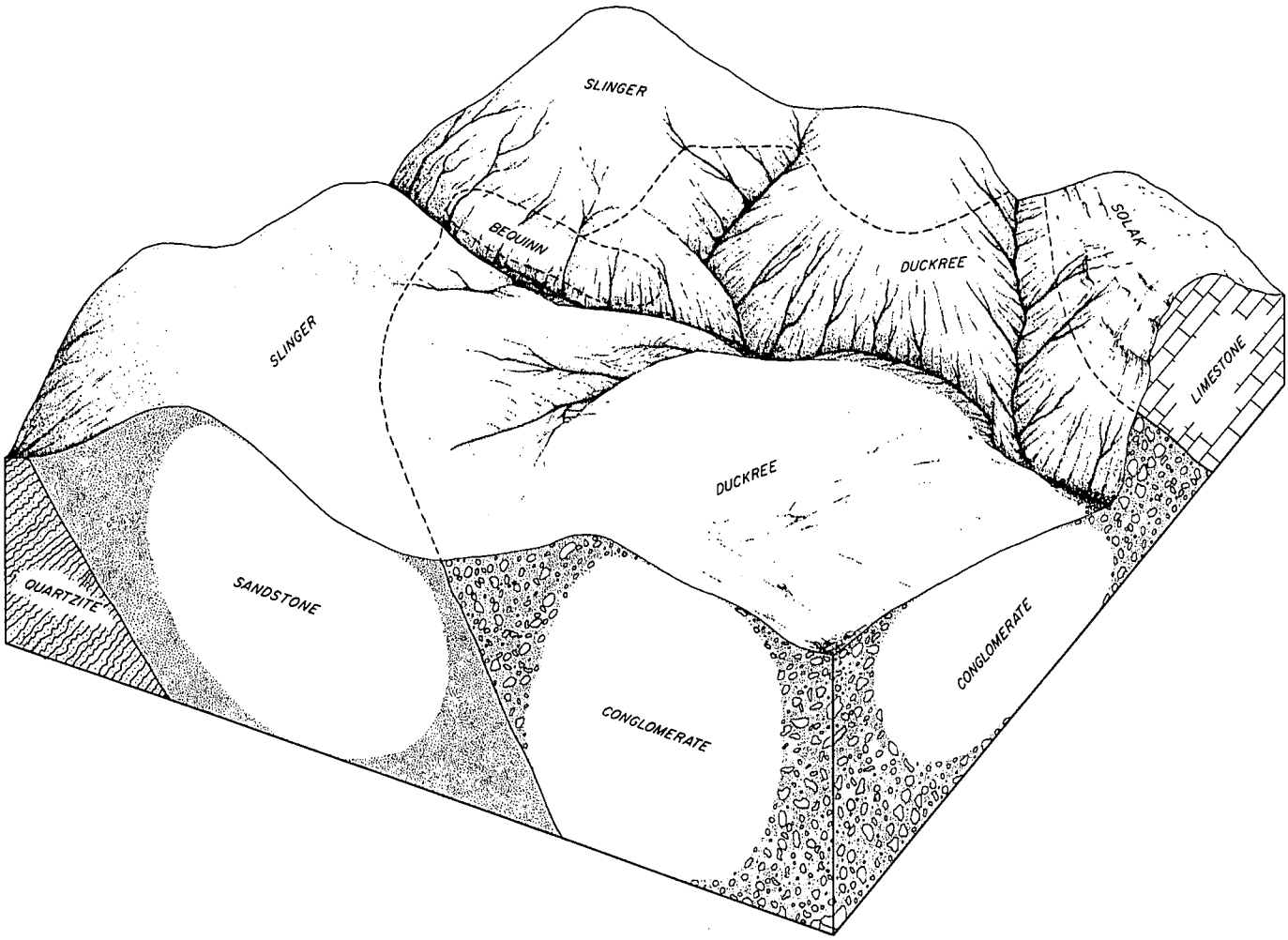


Figure 8.—Typical pattern of soils in general map unit 5.

shallow to very deep soils on the lower parts of uplands, plateaus, foothills, mountainsides, and alluvial fans

This group consists of three map units. It makes up about 43 percent of the survey area. The soils in this group are gently sloping to very steep. The vegetation in areas not cultivated is mainly grasses and shrubs. Elevation is 5,930 to 8,000 feet. The average annual precipitation is about 10 to 18 inches, the mean annual air temperature is 35 to 44 degrees F, and the average freeze-free season is 50 to 90 days.

The soils in this group are shallow to very deep and are well drained and somewhat excessively drained. They formed in residuum, colluvium, and alluvium derived dominantly from sedimentary rock.

This group is used mainly as rangeland and watershed and for wildlife habitat. It is also used as nonirrigated cropland and homesites.

6. Kearl-Richville-Thatcher

Moderately deep and very deep, well drained, gently sloping to steep soils; on alluvial fans, uplands, and foothills

This map unit is in the central and southern parts of the survey area. Slope is 1 to 40 percent. The potential vegetation in areas not cultivated is bluebunch wheatgrass, antelope bitterbrush, Indian ricegrass, and big sagebrush. Elevation is 5,930 to 7,500 feet. The average annual precipitation is about 12 to 16 inches,

the mean annual air temperature is 36 to 44 degrees F, and the average freeze-free season is 55 to 90 days.

This unit makes up about 19 percent of the survey area. It is about 35 percent Kearl soils, 20 percent Richville soils, and 15 percent Thatcher soils. The remaining 30 percent is components of minor extent (fig. 9).

Kearl soils are on uplands and foothills. These soils are moderately deep and well drained. They formed in residuum and colluvium derived dominantly from sandstone. The soils are loam throughout the profile. Sandstone is at a depth of 36 inches.

Richville soils are on uplands. These soils are moderately deep and well drained. They formed in residuum and colluvium derived dominantly from sandstone and siltstone. The surface layer is loam, the subsoil is gravelly loam, and the substratum is gravelly clay loam. Weathered sandstone is at a depth of 34 inches.

Thatcher soils are on alluvial fans and foothills. These soils are very deep and well drained. They formed in alluvium and colluvium derived from a variety of geologic material. The surface layer is silt loam, and the subsoil and substratum are silt loam and silty clay loam.

Of minor extent in this unit are Alhark soils that have a loamy substratum and Ant Flat, Cloud Rim, Despain Variant, Gobine, Lakridge, McCarey, Murphy, Searla, and Vanni soils. All these soils except McCarey soils are very deep and well drained. McCarey soils are moderately deep.

This unit is used mainly as nonirrigated cropland, rangeland, wildlife habitat, and watershed. It is also used as irrigated cropland and homesites.

7. Cutoff-Dennot-Jebo

Moderately deep and deep, well drained and somewhat excessively drained, gently sloping to very steep soils; on foothills, mountainsides, and alluvial fans

This map unit is in the north-central and central parts of the survey area. Slope is 4 to 60 percent. The

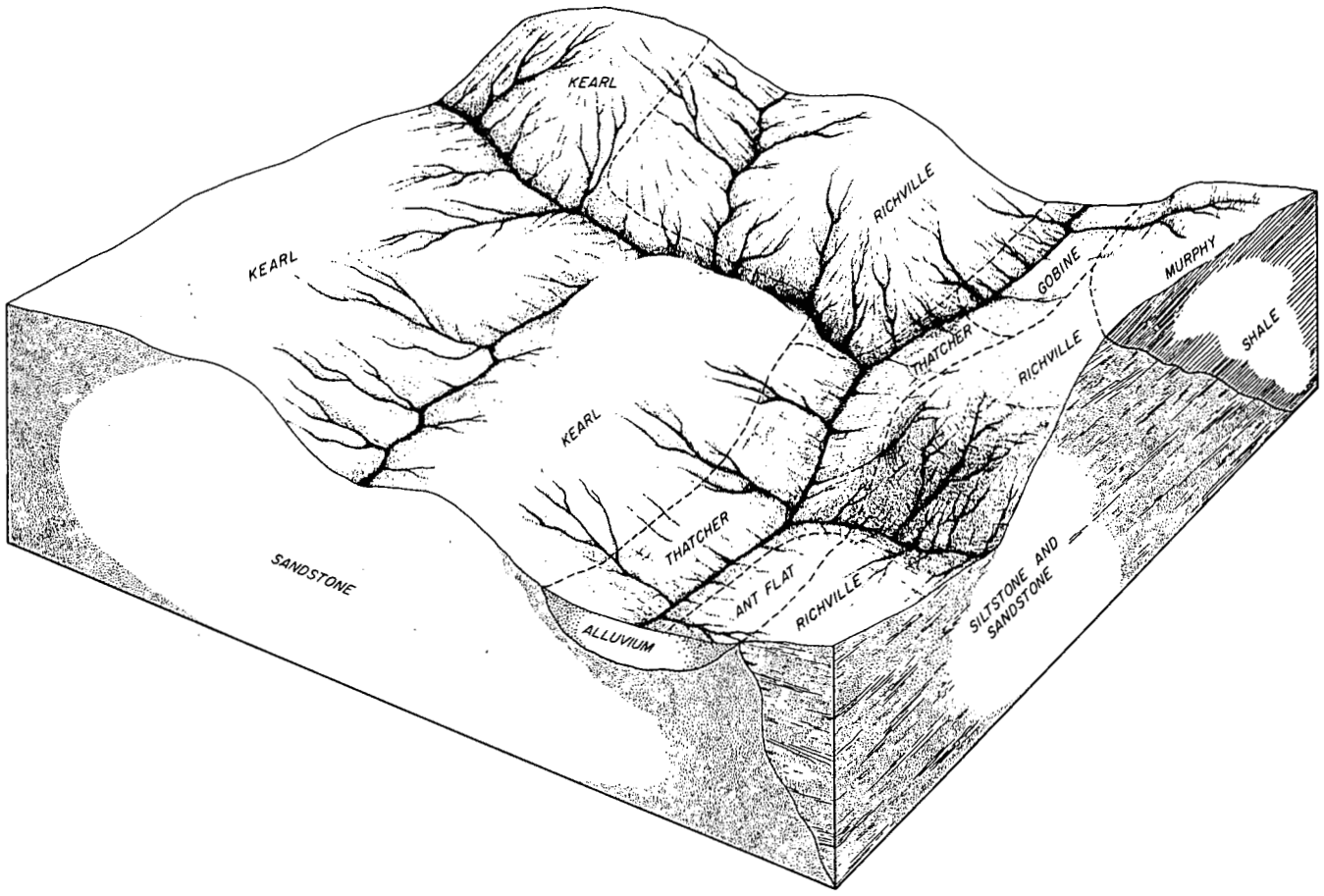


Figure 9.—Typical pattern of soils in general map unit 6.

potential vegetation is mainly bluebunch wheatgrass, muttongrass, and black sagebrush. Elevation is 5,950 to 8,000 feet. The average annual precipitation is about 12 to 18 inches, the mean annual air temperature is 35 to 43 degrees F, and the average freeze-free season is 50 to 90 days.

This unit makes up about 13 percent of the survey area. It is about 30 percent Cutoff soils, 20 percent Dennot soils, 15 percent Jebo soils, and 15 percent Dagan soils. The remaining 20 percent is components of minor extent (fig. 10).

Cutoff soils are on foothills. These soils are moderately deep and well drained. They formed in residuum and colluvium derived dominantly from sandstone. The surface layer is gravelly loam. Below this are gravelly loam and very gravelly loam. Sandstone is at a depth of 35 inches.

Dennot soils are on foothills, toe slopes, and alluvial fans. These soils are deep and well drained. They formed in colluvium and alluvium derived dominantly from conglomerate. The surface layer is very gravelly loam. Below this are very gravelly loam and extremely gravelly sandy loam.

Jebo soils are on foothills and mountainsides. These soils are moderately deep and somewhat excessively drained. They formed in colluvium derived dominantly from sandstone and conglomerate. The surface layer is very gravelly loam. Below this are very gravelly loam, very cobbly loam, and extremely cobbly sandy loam. Conglomerate is at a depth of 35 inches.

Dagan soils are on foothills and escarpments. These soils are deep and very deep and are well drained. They formed in colluvium derived dominantly from sandstone and conglomerate. The surface layer is gravelly silt loam

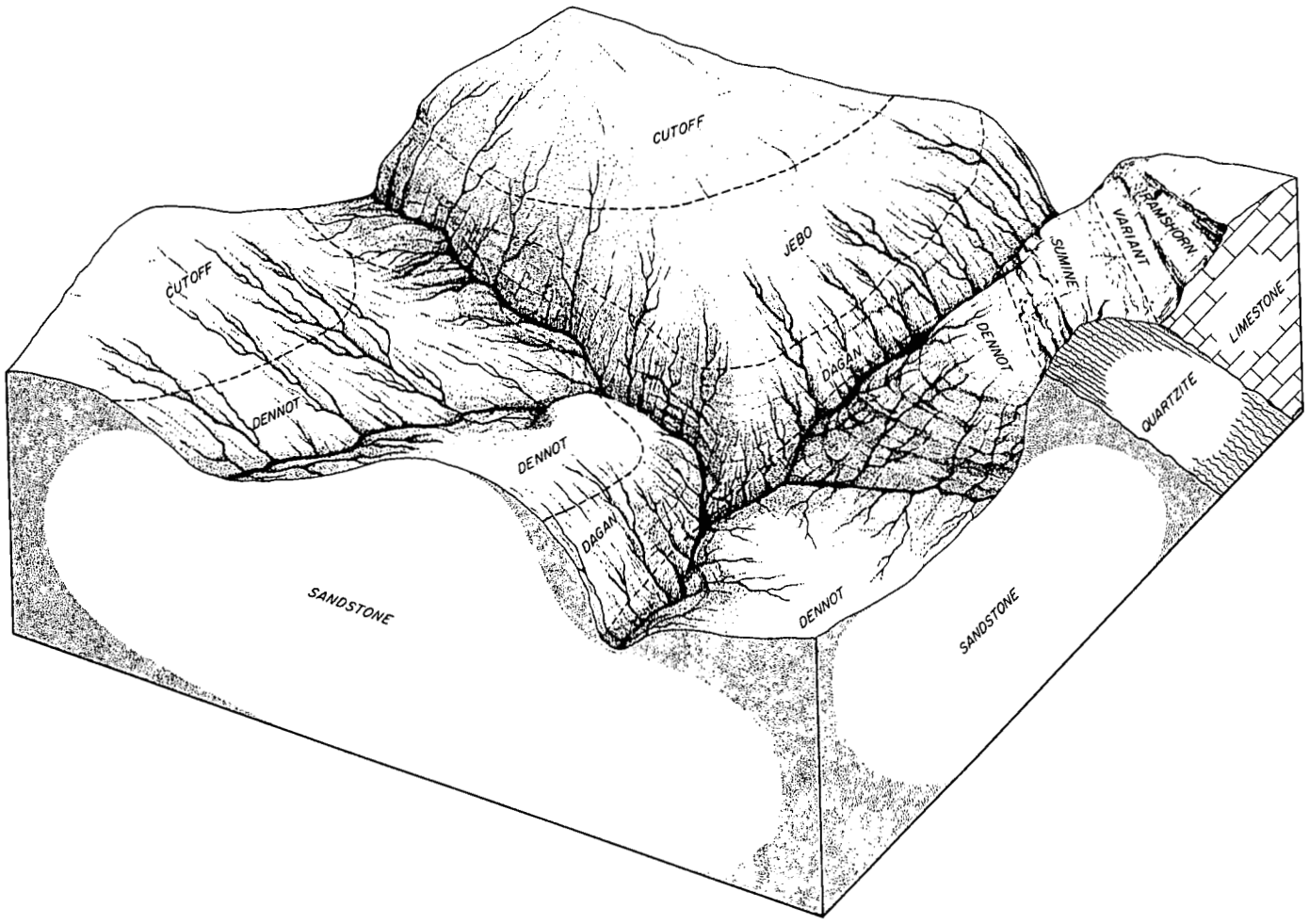


Figure 10.—Typical pattern of soils in general map unit 7.

and gravelly loam. Below this are very gravelly loam, very gravelly silt loam, and extremely gravelly silt loam.

Of minor extent in this unit are Sumine, Lonjon, Highams, Vicking, and Ramshorn Variant soils. These soils are shallow to moderately deep and are well drained.

Most areas of this unit are used as rangeland and watershed and for wildlife habitat. A few areas are used as homesites.

8. Solak-Falula-Rexmont

Shallow, somewhat excessively drained, gently sloping to very steep soils; on foothills, mountainsides, ridges, and plateaus

This map unit is in the north-central, central, and east-central parts of the survey area. Slope is 4 to 70 percent. The potential vegetation is mainly bluebunch wheatgrass, Sandberg bluegrass, and black sagebrush. Elevation is 6,000 to 7,750 feet. The average annual precipitation is about 10 to 16 inches, the mean annual air temperature is 37 to 44 degrees F, and the average freeze-free season is 50 to 85 days.

This unit makes up about 11 percent of the survey area. It is about 35 percent Solak soils, 20 percent Falula soils, 10 percent Rexmont soils, and 10 percent Lundy soils. The remaining 25 percent is components of minor extent.

Solak soils are on mountainsides and ridges. These soils formed in residuum and colluvium derived from conglomerate. They are very gravelly loam and are underlain by conglomerate at a depth of 15 inches.

Falula soils are on foothills and plateaus. These soils formed in residuum and colluvium derived from conglomerate and sandstone. They are very gravelly loam and are underlain by conglomerate at a depth of 17 inches.

Rexmont soils are on mountainsides and ridgetops. These soils formed in residuum and colluvium derived from limestone. They are very cobbly loam and are underlain by limestone at a depth of 15 inches.

Lundy soils are on mountainsides. These soils formed in residuum and colluvium derived from limestone. They are very gravelly loam and are underlain by limestone at a depth of 16 inches.

Of minor extent in this unit are Ellett, Gridge, Highams Variant, Fontreen, and Ranruff soils. These soils are shallow and well drained to somewhat excessively drained. Small areas of Ramshorn soils are along the toe slopes of the Crawford Mountains. Also of minor extent in the unit are areas of Rock outcrop.

This unit is used as rangeland and watershed and for wildlife habitat.

very shallow to very deep soils on the upper parts of alluvial fans and on plateaus, mountainsides, and the sides of foothills

This group consists of two map units. It makes up about 11 percent of the survey area. The soils in this group are gently sloping to very steep. The vegetation in areas not cultivated is mainly grasses and shrubs. Elevation is 6,000 to 8,500 feet. The average annual precipitation is about 14 to 35 inches, the mean annual air temperature is 32 to 42 degrees F, and the freeze-free season is 30 to 90 days.

The soils in this group are very shallow to very deep and are well drained and somewhat excessively drained. They formed in alluvium, colluvium, and residuum derived dominantly from sedimentary rock.

Most areas of this group are used as rangeland, for wildlife habitat, and as watershed. A few areas are used as homesites.

9. Bullnel-Dagan-Yeates Hollow

Moderately deep to very deep, well drained, gently sloping to steep soils; on mountainsides, plateaus, foothills, and alluvial fans

This map unit is in the western and southwestern parts of the survey area. Slope is 4 to 40 percent. The potential vegetation is mainly bluebunch wheatgrass, bitterbrush, and birchleaf mountainmahogany. Elevation is 6,500 to 8,300 feet. The average annual precipitation is about 15 to 25 inches, the mean annual air temperature is 34 to 42 degrees F, and the average freeze-free season is 60 t0 90 days.

This unit makes up about 8 percent of the survey area. It is about 35 percent Bullnel soils, 25 percent Dagan soils, and 10 percent Yeates Hollow soils. The remaining 30 percent is components of minor extent (fig. 11).

Bullnel soils are on plateaus and mountainsides. These soils are moderately deep and well drained. They formed in residuum and colluvium derived dominantly from sandstone and shale. The surface layer is loam, and the subsoil is gravelly loam and cobbly loam. Sandstone is at a depth of 39 inches.

Dagan soils are on mountainsides. These soils are deep and well drained. They formed in colluvium derived dominantly from conglomerate. The surface layer is gravelly loam, and the subsoil is very gravelly loam. These soils are moist.

Yeates Hollow soils are on alluvial fans, foothills, and mountainsides. These soils are deep and very deep and are well drained. They formed in colluvium, alluvium, and residuum derived from a variety of geologic material. The surface layer is stony loam, and the subsoil is very gravelly clay loam.

Of minor extent in this unit are Obray, Despain, Etchen, Guilder, Horrocks, Hades, and St. Marys soils.

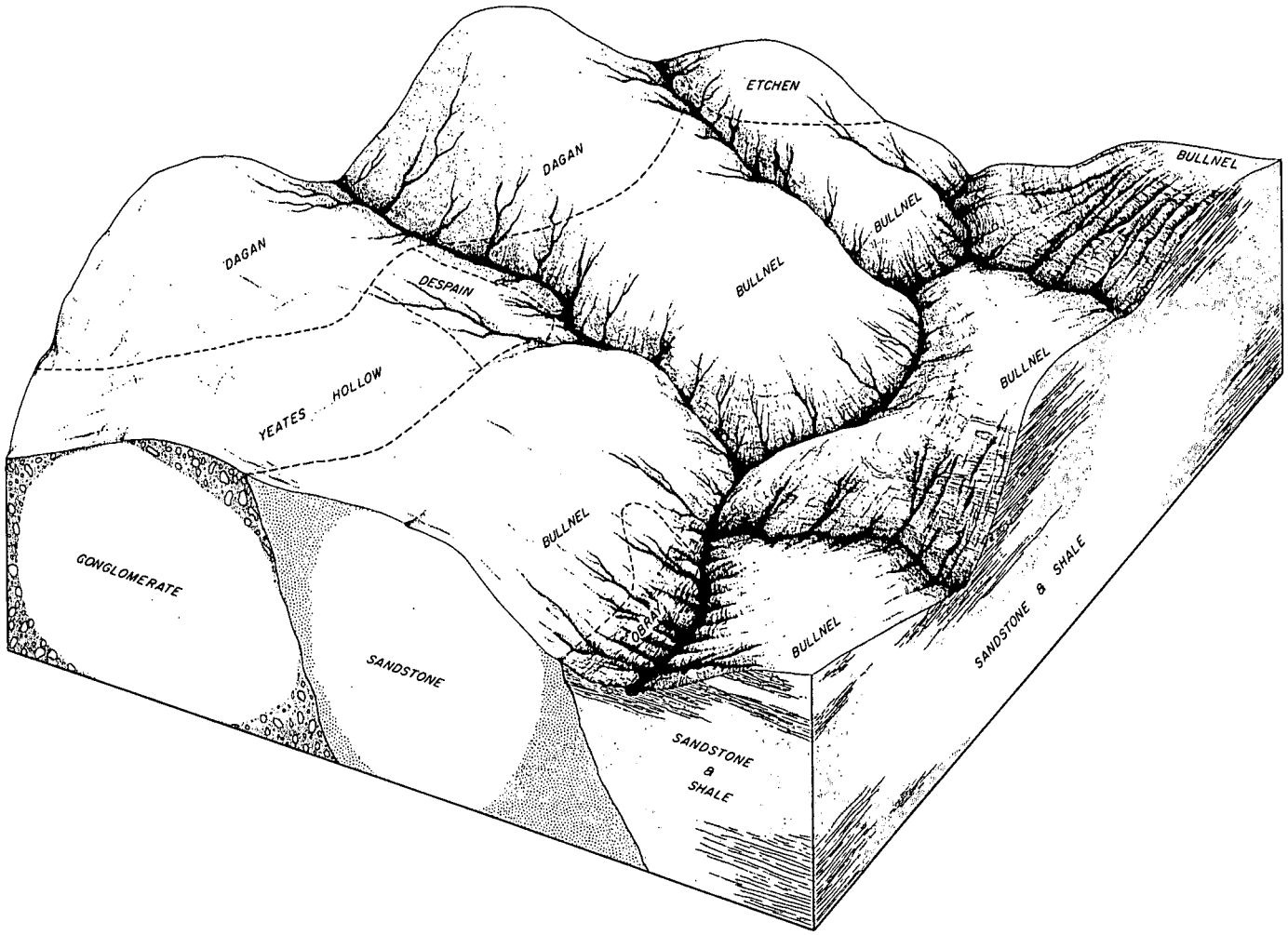


Figure 11.—Typical pattern of soils in general map unit 9.

Most areas of this unit are used as rangeland, for wildlife habitat, and as watershed. A few areas are used as homesites.

10. Agassiz-Foxol-Rock outcrop

Very shallow and shallow, somewhat excessively drained, moderately steep to very steep soils, and Rock outcrop; on ridges and mountainsides

This map unit is in the northwestern and west-central parts of the survey area. Slope is 10 to 60 percent. The potential vegetation is mainly bluebunch wheatgrass, curlleaf mountainmahogany, and low sagebrush. Elevation is 6,000 to 8,500 feet. The average annual precipitation is about 14 to 35 inches, the mean annual air temperature is 32 to 42 degrees F, and the average freeze-free season is 30 to 70 days.

This unit makes up about 3 percent of the survey area. It is about 50 percent Agassiz soils, 30 percent Foxol soils, and 10 percent Rock outcrop. The remaining 10 percent is components of minor extent.

Agassiz soils are on mountainsides. These soils are very shallow and shallow and are somewhat excessively drained. They formed in residuum and colluvium derived dominantly from limestone and quartzite. Agassiz soils are very gravelly loam and are underlain by limestone at a depth of 10 inches.

Foxol soils are on ridges and mountainsides. These soils are shallow and somewhat excessively drained. They formed in residuum and colluvium derived dominantly from limestone and quartzite. Foxol soils are

very stony loam and very cobbly loam and are underlain by quartzite at a depth of 15 inches.

Rock outcrop consists of areas of exposed limestone and quartzite.

Of minor extent in this unit are Hawkins, Hourglass, Sumine, and Richville soils.

This unit is used as rangeland and watershed and for wildlife habitat.

very deep soils on high mountainsides

This group consists of two map units. It makes up about 9 percent of this survey area. The soils in this group are strongly sloping to very steep. The vegetation in areas not cultivated is mainly grasses, forbs, and trees. Elevation is 6,500 to 8,700 feet. The average annual precipitation is about 25 to 40 inches, the mean annual air temperature is 32 to 39 degrees F, and the average freeze-free season is 30 to 70 days.

The soils in this group are very deep and well drained. They formed in colluvium derived dominantly from sedimentary rock.

This group is used as woodland, for livestock grazing and wildlife habitat, and as watershed.

11. Yeljack-Baird Hollow-Lucky Star

Very deep, well drained, strongly sloping to steep soils; on mountainsides and ridges

This map unit is in the northwestern and west-central parts of the survey area. Slope is 8 to 30 percent. The potential vegetation is mainly aspen with an understory of grasses and forbs. Elevation is 6,500 to 8,700 feet. The average annual precipitation is about 25 to 35 inches, the mean annual air temperature is 32 to 39 degrees F, and the average freeze-free season is 30 to 70 days.

This unit makes up about 5 percent of the survey area. It is about 30 percent Yeljack soils, 25 percent Baird Hollow soils, and 20 percent Lucky Star soils. The remaining 25 percent is components of minor extent.

Yeljack soils are on mountainsides and ridges. These soils formed in colluvium derived dominantly from sandstone. The surface layer is loam, and the subsoil is sandy clay loam.

Baird Hollow soils are on mountainsides. These soils formed in colluvium derived dominantly from sedimentary rock. The surface is covered with a mat of partially decomposed leaves and twigs. The surface layer is silt loam, and the subsoil is very cobbly clay loam.

Lucky Star soils are on mountainsides. These soils formed in colluvium derived dominantly from sedimentary rock. The surface is covered with a mat of partially decomposed leaves and twigs. The surface layer is gravelly loam, and the subsoil is extremely cobbly clay loam.

Of minor extent in this unit are Ercan, Condie, Flygare, and Richens soils. Ercan, Flygare, and Richens soils are dominantly on north-facing side slopes and support stands of aspen. Condie soils are on mountainsides and support stands of conifers.

This unit is used as woodland, for livestock grazing and wildlife habitat, and as watershed.

12. Lucky Star-Condie-Sambrito

Very deep, well drained, steep and very steep soils; on mountainsides

This map unit is in the northwestern, west-central, and southwestern parts of the survey area. Slope is 25 to 60 percent. The vegetation on the Lucky Star soils is mainly aspen with an understory of grasses and forbs. The vegetation on the Condie and Sambrito soils is mainly conifers. Elevation is 6,500 to 9,000 feet. The average annual precipitation is about 25 to 40 inches, the mean annual air temperature is 32 to 39 degrees F, and the average freeze-free season is 30 to 70 days.

This unit makes up about 4 percent of the survey area. It is about 50 percent Lucky Star soils, 15 percent Condie soils, and 10 percent Sambrito soils. The remaining 25 percent is components of minor extent (fig. 12).

The soils in this unit formed in colluvium derived dominantly from sedimentary rock. Lucky Star soils have a surface layer of gravelly loam and a subsoil of very gravelly clay loam. Condie soils have a surface layer of gravelly loam and a subsoil of extremely gravelly clay loam. Sambrito soils have a surface layer of sandy loam, a subsoil of fine sandy loam, and a substratum of sandy loam and loamy sand.

Of minor extent in this unit are Scout, Hourglass, Yeljack, Mult, Mirror Lake, Kamack, and Cluff soils. Scout, Hourglass, Mult, Mirror Lake, Kamack, and Cluff soils are on north- and east-facing side slopes and support stands of conifers. Yeljack soils are on north- and northeast-facing side slopes and support stands of aspen.

This unit is used as woodland, for livestock grazing and wildlife habitat, and as watershed.

broad land use considerations

The general soil map is most useful in determining the general outline of areas that are suitable for use as irrigated and nonirrigated cropland, woodland, and rangeland, and for hay, pasture, and recreation. It cannot be used for selection of sites for specific structures.

Areas suited to irrigated crops are mostly in general map units 3, 4, and 6. If irrigated crops are grown in these areas, an adequate supply of irrigation water must be made available. Nonirrigated cropland is mostly in unit 6. The soils in units adjacent to unit 6 are too shallow, too stony, or do not receive sufficient rainfall.

Some areas of rangeland are in most units. Wet rangeland is in units 1 and 2. Large areas of units 3, 4,

and 6 are suitable for mechanical brush removal and seeding. Some areas in units 5, 7, 8, and 9 are suitable for chemical brush control. Parts of the areas under juniper in unit 8 support understory vegetation suitable for grazing. Units 9, 10, 11, and 12 are mountainous and are used mostly as summer range. Unit 11 and part of unit 12 have a cover of mostly aspen, but the understory vegetation is used for grazing.

Areas of hay and pasture are mostly in units 1 and 2.

Woodland is dominantly in units 8, 11, and 12. The trees in unit 8 are mainly juniper, those in unit 11 are mainly aspen, and those in unit 12 are a mixture of aspen and conifers.

Recreational areas are dominantly in units 1, 6, 7, and 8. They are mainly close to Bear Lake or to towns. A few hunting cabins are in units 11 and 12.

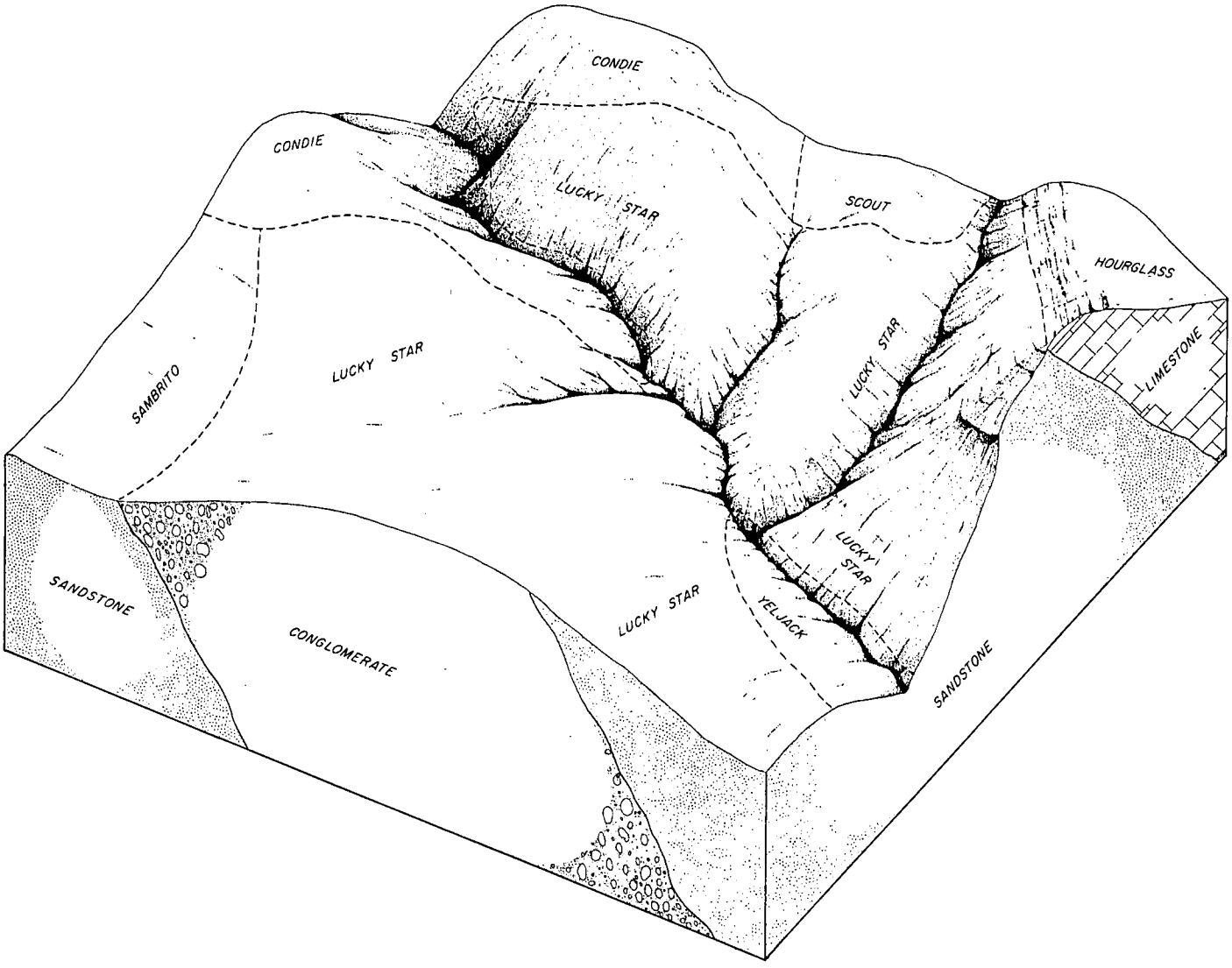


Figure 12.—Typical pattern of soils in general map unit 12.

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, Nevka loam is one of several phases in the Nevka 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. Falula-Kearl complex, 4 to 25 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. Duckree-St. Marys, dry association, 25 to 50 percent slopes, 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. Pits-Dumps complex 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 2 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils.

map unit descriptions

AAD—Agassiz-Mult complex, 10 to 25 percent slopes. This map unit is on hilly to steep mountainsides along the Rich County line, west of Randolph. Elevation is 7,800 to 8,700 feet. The average annual precipitation is about 18 to 25 inches. The mean annual air temperature is 31 to 36 degrees F, and the average freeze-free season is 30 to 55 days.

This unit is 55 percent Agassiz very stony loam and 35 percent Mult loam. The Agassiz soil is dominantly on southeast-facing side slopes, and the Mult soil is dominantly on northeast-facing side slopes. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit is about 5 percent moderately deep, well drained soils that are 35 to 70 percent rock fragments and are in the lower lying areas. Also included is about 5 percent deep, well drained soils that are under stands of conifer trees and are on north-facing side slopes.

The Agassiz soil is shallow and somewhat excessively drained. It formed in residuum derived dominantly from

limestone. Slopes are medium to long and are convex. The present vegetation is mainly bluebunch wheatgrass, antelope bitterbrush, curlleaf mountainmahogany, and muttongrass.

Typically, the surface layer of the Agassiz soil is dark brown very stony loam 5 inches thick. The underlying material is dark brown very cobbly loam 7 inches thick. Limestone is at a depth of 12 inches. Depth to limestone ranges from 10 to 20 inches.

Permeability of the Agassiz soil is moderate. Available water capacity is about 1 inch to 2 inches. Water supplying capacity is 3 to 6 inches. Effective rooting depth is 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is moderate.

The Mult soil is moderately deep and well drained. It formed in residuum and colluvium derived dominantly from limestone. Slopes are long and convex or concave. The present vegetation is mainly subalpine fir, Douglas-fir, and Engelmann spruce.

Typically, the surface of the Mult soil is covered with a mat of partially decomposed needles and twigs 1 inch thick. The surface layer is dark brown loam 10 inches thick. The subsoil is brown clay loam 28 inches thick. Limestone is at a depth of 38 inches. Depth to limestone ranges from 20 to 40 inches.

Permeability of the Mult soil is moderately slow. Available water capacity is about 5.5 to 7.0 inches. Water supplying capacity is 10 to 14 inches. Effective rooting depth is 20 to 40 inches. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used for livestock grazing and wildlife habitat.

Management practices and capability classification are not provided for this unit (all in National Forest).

AAF—Agassiz-Mult complex, 25 to 60 percent slopes. This map unit is on mountainsides along the Rich County line, west and southwest of Randolph. Elevation is 7,800 to 8,700 feet. The average annual precipitation is about 18 to 25 inches, the mean annual air temperature is 31 to 36 degrees F, and the average freeze-free season is 30 to 55 days.

This unit is 50 percent Agassiz very stony loam and 35 percent Mult loam. The Agassiz soil is dominantly on southeast-facing side slopes and on ridgetops, and the Mult soil is dominantly on northeast-facing side slopes. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are about 6 percent moderately deep, well drained soils that are 35 to 70 percent rock fragments and are in the lower lying areas on southeast-facing side slopes, 5 percent deep, well drained soils intermingled throughout areas of the Mult soils, and 4 percent shallow soils that support stunted stands of aspen and conifers. Included areas make up about 15 percent of the total acreage.

The Agassiz soil is shallow and somewhat excessively drained. It formed in residuum derived dominantly from limestone. Slopes are medium to long and are convex. The present vegetation is mainly bluebunch wheatgrass, antelope bitterbrush, curlleaf mountainmahogany, and muttongrass.

Typically, the surface layer of the Agassiz soil is dark brown very stony loam 5 inches thick. The underlying material is dark brown very cobbly loam 7 inches thick. Limestone is at a depth of 12 inches. Depth to limestone ranges from 10 to 20 inches.

Permeability of the Agassiz soil is moderate. Available water capacity is about 1 inch to 2 inches. Water supplying capacity is 3 to 6 inches. Effective rooting depth is 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is moderate.

The Mult soil is moderately deep and well drained. It formed in residuum and colluvium derived dominantly from limestone. Slopes are long and convex or concave. The present vegetation is mainly subalpine fir, Douglas-fir, and Engelmann spruce.

Typically, the surface of the Mult soil is covered with a mat of partially decomposed needles and twigs 1 inch thick. The surface layer is dark brown loam 10 inches thick. The subsoil is brown clay loam 28 inches thick. Limestone is at a depth of 38 inches. Depth to limestone ranges from 20 to 40 inches.

Permeability of the Mult soil is moderately slow. Available water capacity is about 5.5 to 7.0 inches. Water supplying capacity is 10 to 14 inches. Effective rooting depth is 20 to 40 inches. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used as rangeland and for wildlife habitat.

Management practices and capability classification are not provided for this unit (all in National Forest).

ABF—Agassiz-Richville complex, 10 to 60 percent slopes. This map unit is on mountainsides west of Bear Lake and north of Garden City. The present vegetation is mainly bluebunch wheatgrass, big sagebrush, antelope bitterbrush, mountain snowberry, and curlleaf mountainmahogany. Elevation is 6,000 to 7,200 feet. The average annual precipitation is about 16 to 20 inches, the mean annual air temperature is 37 to 42 degrees F, and the average freeze-free season is 70 to 85 days.

This unit is 40 percent Agassiz stony loam, very shallow, 25 to 60 percent slopes, and 40 percent Richville loam, 10 to 40 percent slopes. The Agassiz soil is in the steeper areas, and the Richville soil is in the more gently sloping areas. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are about 7 percent Obray silty clay loam that has slopes of 6 to 25 percent and is in concave areas; 5 percent areas of Rock outcrop on ridges; 3 percent Despain gravelly loam, 30 to 60 percent slopes, on north-facing side slopes; and 5

percent Vanni loam, 30 to 50 percent slopes, on mountainsides.

The Agassiz soil is very shallow and somewhat excessively drained. It formed in residuum and colluvium derived dominantly from limestone. Slopes are long and convex. They face south and east. Typically, 2 to 5 percent of the surface is covered with stones. The surface layer is dark brown stony loam 6 inches thick. The underlying material is dark brown extremely gravelly loam 4 inches thick. Limestone is at a depth of 10 inches. Depth to limestone ranges from 10 to 20 inches.

Permeability of the Agassiz soil is moderate. Available water capacity is about 0.8 inch to 1.5 inches. Water supplying capacity is 3 to 6 inches. Effective rooting depth is 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is moderate.

The Richville soil is moderately deep and well drained. It formed in residuum derived dominantly from sandstone and siltstone. Slopes are short and concave. Typically, the surface layer is very dark grayish brown loam 12 inches thick. The subsoil is dark brown loam 9 inches thick. The substratum is pale olive loam 10 inches thick. Weathered siltstone is at a depth of 31 inches. Depth to siltstone ranges from 20 to 40 inches.

Permeability of the Richville soil is moderately slow. Available water capacity is about 4 to 5 inches. Water supplying capacity is 8 to 10 inches. Effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is moderate.

This unit is used mainly as rangeland and for wildlife habitat. It is also used for homesite development.

The potential plant community on the Agassiz soil is mainly curlleaf mountainmahogany, bluebunch wheatgrass, antelope bitterbrush, basin wildrye, and muttongrass. The potential plant community on the Richville soil is mainly bluebunch wheatgrass, Nevada bluegrass, birchleaf mountainmahogany, and muttongrass. The suitability of this unit for rangeland seeding is poor. The main limitations are rock fragments on the surface and depth to bedrock.

Management practices that maintain or improve the range vegetation include proper grazing use, planned grazing systems, fencing, and stock water development. Shrubs on this unit provide food and cover for deer in winter.

Population growth has resulted in increased construction of homes on this unit. The main limitations for use of this unit as homesites are the depth to bedrock and slope. Cuts needed to provide essentially level building sites can expose bedrock. Erosion is a hazard in the steeper areas; therefore, only the part of the site that is used for construction should be disturbed.

Slope is a concern in installing septic tank absorption fields. Absorption lines should be installed on the contour.

This map unit is in capability unit VIIs-M3, nonirrigated. The Agassiz soil is in Mountain Shallow Loam (Curlleaf Mountainmahogany) range site, and the Richville soil is in Mountain Gravelly Loam range site.

ACF—Agassiz-Rock outcrop complex, 25 to 60 percent slopes. This map unit is on mountainsides west of Bear Lake and near Monte Cristo Peak, west of Woodruff. The present vegetation is mainly curlleaf mountainmahogany, kings fescue, bluebunch wheatgrass, and low sagebrush. Elevation is 6,200 to 8,500 feet. The average annual precipitation is about 16 to 35 inches, the mean annual air temperature is 32 to 40 degrees F, and the average freeze-free season is 30 to 70 days.

This unit is 60 percent Agassiz stony loam, 25 to 60 percent slopes, and 25 percent Rock outcrop. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are about 4 percent Hourglass silt loam, 25 to 50 percent slopes, that is on north-facing side slopes and is under stands of conifers; 9 percent Lucky Star gravelly loam, 25 to 60 percent slopes, under stands of aspen; and 2 percent moderately deep, somewhat excessively drained soils that are 35 to 70 percent rock fragments and are scattered throughout the unit. Also included are soils that are similar to the Agassiz soil but are moderately deep to bedrock.

The Agassiz soil is very shallow and somewhat excessively drained. It formed in residuum and colluvium derived dominantly from limestone. Slopes are long and convex. They face east, south, and west. Typically, 2 to 5 percent of the surface is covered with stones. The surface layer is very dark grayish brown stony loam 6 inches thick. The next layer is dark brown extremely gravelly loam 4 inches thick. Limestone is at a depth of 10 inches. Depth to limestone is 10 inches or less.

Permeability of the Agassiz soil is moderate. Available water capacity is about 0.8 inch to 1.5 inches. Water supplying capacity is 3 to 6 inches. Effective rooting depth is about 10 inches. Runoff is rapid, and the hazard of water erosion is moderate.

Rock outcrop consists of areas of exposed limestone. It occurs mainly as ledges and cliffs. Runoff is very rapid.

This unit is used as rangeland and for wildlife habitat.

The potential plant community on the Agassiz soil is mainly curlleaf mountainmahogany, bluebunch wheatgrass, low sagebrush, and antelope bitterbrush. The suitability of this soil for rangeland seeding is very poor. The main limitations are steepness of slope, rock fragments on the surface, and depth to bedrock.

Management practices that maintain or improve the range vegetation include proper grazing use, planned grazing systems, fencing, and stock water development. Shrubs can be controlled by chemical treatment.

This map unit is in capability unit VIIs-M3, nonirrigated, and in Mountain Shallow Loam (Curlleaf Mountainmahogany) range site.

ADD—Alhark loam, 6 to 15 percent slopes. This deep, well drained soil is on rolling foothills, mainly west of Randolph and Woodruff. It formed in residuum derived dominantly from sandstone. Slopes are long and convex or concave. They face north and east. The present vegetation is mainly big sagebrush, lanceleaf yellowbrush, western wheatgrass, and Sandberg bluegrass. Elevation is 6,500 to 7,100 feet. The average annual precipitation is about 9 to 12 inches, the mean annual air temperature is 39 to 41 degrees F, and the average freeze-free season is 60 to 75 days.

Typically, the surface layer is brown loam about 5 inches thick. The upper 19 inches of the underlying material is reddish yellow loam, and the lower 18 inches is reddish yellow loam and gravelly loam. Fractured sandstone is at a depth of 42 inches. Depth to bedrock ranges from 40 to 60 inches.

Included in this unit are about 10 percent Slinger gravelly loam, 25 to 40 percent slopes, on south- and west-facing side slopes; 3 percent Duckree gravelly silt loam, 15 to 40 percent slopes, on ridges and on south- and west-facing side slopes; 2 percent Alhark loam, 15 to 30 percent slopes, in the steeper areas; and 3 percent Lariat fine sandy loam, 4 to 10 percent slopes. Also included are small areas of Pancheri silt loam, cool, 5 to 10 percent slopes, and Cowco loam, 3 to 6 percent slopes. Included areas make up about 20 percent of the total acreage.

Permeability of this Alhark soil is moderate. Available water capacity is about 6 to 7 inches. Water supplying capacity is 6 to 8 inches. Effective rooting depth is 40 to 60 inches. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used as rangeland and for wildlife habitat.

The potential plant community on this unit is mainly bluebunch wheatgrass, needleandthread, big sagebrush, and bottlebrush squirreltail. The suitability of the soil in this unit for rangeland seeding is fair. The main limitation is low precipitation.

Practices suitable for use on this unit are proper grazing use and planned grazing systems. Shrubs can be controlled by chemical treatment, mechanical treatment, or prescribed burning.

This map unit is in capability unit VIe-S, nonirrigated, and in Semidesert Loam range site.

ADE—Alhark loam, 15 to 30 percent slopes. This deep, well drained soil is on foothills west of Randolph and Woodruff. It formed in residuum and colluvium derived dominantly from sandstone. Slopes are medium in length and are concave or convex. They face north and east. The present vegetation is mainly big sagebrush, western wheatgrass, Utah serviceberry, and lanceleaf yellowbrush. Elevation is 6,500 to 7,200 feet. The average annual precipitation is about 9 to 13 inches. The mean annual air temperature is 39 to 41 degrees F, and the average freeze-free season is 60 to 70 days.

Typically, the surface layer is brown loam about 12 inches thick. The underlying material is light brown gravelly loam 34 inches thick. Fractured sandstone is at a depth of 46 inches. Depth to bedrock ranges from 40 to 60 inches.

Included in this unit are about 2 percent Alhark loam, 6 to 15 percent slopes, in the more gently sloping areas; 3 percent Cutoff gravelly loam, 25 to 60 percent slopes, on short, very steep side slopes; 2 percent Pancheri silt loam, cool, 10 to 25 percent slopes, commonly in the less steeply sloping areas; and 3 percent Slinger gravelly loam, 25 to 40 percent slopes, on south- and west-facing side slopes.

Permeability of this Alhark soil is moderate. Available water capacity is about 5.5 to 6.5 inches. Water supplying capacity is 6 to 8 inches. Effective rooting depth is 40 to 60 inches. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used as rangeland and for wildlife habitat.

The potential plant community on this unit is mainly bluebunch wheatgrass, needleandthread, big sagebrush, and bottlebrush squirreltail. The suitability of the soil in this unit for rangeland seeding is poor. The main limitations are slope and low precipitation.

Practices suitable for use on this unit are proper grazing use and planned grazing systems. Shrubs can be controlled by chemical treatment or prescribed burning.

This map unit is in capability unit VIe-S, nonirrigated, and in Semidesert Loam range site.

AEC—Alhark silt loam, loamy substratum, 4 to 10 percent slopes. This very deep, well drained soil is on toe slopes of valley sides along Negro Dan Hollow and Saleratus Creek. It formed in colluvium and alluvium derived dominantly from sandstone. Slopes are medium in length and are slightly convex. The present vegetation is mainly big sagebrush, lanceleaf yellowbrush, western wheatgrass, antelope bitterbrush, and Sandberg bluegrass. Elevation is 6,400 to 6,800 feet. The average annual precipitation is about 12 to 14 inches, the mean annual air temperature is 37 to 40 degrees F, and the average freeze-free season is 55 to 70 days.

Typically, the surface layer is yellowish red silt loam about 7 inches thick. The underlying material to a depth of 60 inches or more is yellowish red and reddish yellow loam.

Included in this unit are about 7 percent Saleratus loam on narrow flood plains; 4 percent Bockston loam, cool, 3 to 6 percent slopes; 2 percent Alhark loam, 6 to 15 percent slopes, in the higher lying areas; and 2 percent soils, scattered throughout the unit, that are similar to this Alhark soil but are lower in content of clay.

Permeability of this Alhark soil is moderate. Available water capacity is about 9 to 10 inches. Water supplying capacity is 9 to 10 inches. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used as rangeland and for wildlife habitat.

The potential plant community on this unit is mainly bluebunch wheatgrass, antelope bitterbrush, Indian ricegrass, and big sagebrush. The suitability of the soil in this unit for rangeland seeding is good.

Practices suitable for use on this unit are proper grazing use and planned grazing systems. Shrubs can be controlled by chemical treatment, mechanical treatment, or prescribed burning.

This map unit is in capability unit VIe-U, nonirrigated, and in Upland Loam range site.

AFD—Ant Flat silt loam, dry, 10 to 25 percent slopes. This very deep, well drained soil is on the sides of foothills west of Bear Lake. It formed in alluvium derived dominantly from sandstone, quartzite, and limestone. Slopes are medium in length and are concave or convex. They dominantly face east. The present vegetation is mainly big sagebrush, Sandberg bluegrass, lanceleaf yellowbrush, and Utah serviceberry. Elevation is 6,000 to 7,000 feet. The average annual precipitation is about 14 to 16 inches, the mean annual air temperature is 40 to 42 degrees F, and the average freeze-free season is 75 to 85 days.

Typically, the surface layer is dark brown silt loam 12 inches thick. The upper 35 inches of the subsoil is brown silty clay loam and silty clay, and the lower part to a depth of 60 inches or more is brown silty clay loam. A layer of carbonate accumulation is at a depth of about 33 inches.

Included in this unit are about 4 percent Cloud Rim loam, dry, that has slopes of 4 to 15 percent; 8 percent Thatcher silt loam, warm, 10 to 25 percent slopes; 4 percent Obray silty clay loam that has slopes of 6 to 25 percent and is in slightly concave areas; and 4 percent McCarey loam that has slopes of 4 to 15 percent.

Permeability of this Ant Flat soil is slow. Available water capacity is about 10 to 11 inches. Water supplying capacity is 9 to 12 inches. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used as rangeland and for nonirrigated crops, homesite development, and wildlife habitat.

The potential plant community on this unit is mainly bluebunch wheatgrass, antelope bitterbrush, Indian ricegrass, and big sagebrush. The average annual production of air-dry vegetation ranges from 700 to 2,250 pounds. The suitability of the unit for rangeland seeding is fair. The main limitation for seeding is slope.

Management practices suitable for use on this unit are proper grazing use and planned grazing systems. Shrubs can be controlled by chemical treatment, mechanical treatment, or prescribed burning.

This unit is well suited to nonirrigated crops. Because precipitation is not sufficient for annual cropping, a cropping system that includes small grain and summer fallow is most suitable. Maintaining crop residue on or near the surface reduces runoff, reduces soil blowing, and helps to maintain soil tilth and organic matter content. All tillage should be on the contour or across the slope.

Population growth has resulted in increased construction of homes on this unit. The main limitations for use of this unit as homesites are slope, slow permeability, low load supporting capacity when the soil is wet, and high shrink-swell potential. The effects of shrinking and swelling can be minimized by using proper engineering designs and by backfilling with material that has low shrink-swell potential. Buildings and roads should be designed to offset the limited ability of the soil in this unit to support a load.

Where septic tanks are used, the limitation of slow permeability can be overcome by increasing the size of the absorption field.

In summer, irrigation is needed for lawn grasses, shrubs, vines, shade trees, and ornamental trees.

This map unit is in capability unit VIe-U, nonirrigated, and in Upland Loam range site.

BAD—Baird Hollow silt loam, 10 to 25 percent slopes. This very deep, well drained soil is on mountainsides along the western boundary of Rich County. It formed in colluvium derived dominantly from sandstone, siltstone, and conglomerate. Slopes are long and concave or convex. They dominantly face east. The present vegetation is mainly quaking aspen, mountain brome, mountain snowberry, and myrtle pachystima. Elevation is 6,800 to 7,800 feet. The average annual precipitation is about 25 to 35 inches, the mean annual air temperature is 35 to 38 degrees F, and the average freeze-free season is 55 to 65 days.

Typically, the surface is covered with a mat of partially decomposed leaves and twigs 1 inch thick. The surface layer is very dark brown silt loam and gravelly clay loam 19 inches thick. The subsurface layer is dark brown gravelly clay loam 7 inches thick. The subsoil to a depth of 60 inches or more is brown very cobbly and extremely cobbly clay loam.

Included in this unit are about 10 percent Lucky Star gravelly loam, 8 to 25 percent slopes; 3 percent Condie gravelly loam, 6 to 25 percent slopes, that is under stands of conifers; and 2 percent Dagan gravelly loam, moist, 25 to 40 percent slopes, under sagebrush and grass.

Permeability of the Baird Hollow soil is slow. Available water capacity is about 6.5 to 8.0 inches. Water supplying capacity is 14 to 20 inches. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is moderate.

This unit is woodland, but it is used primarily for livestock grazing and wildlife habitat.

This unit is poorly suited to aspen. Based on a site index of 54, the potential production per acre of merchantable timber is 2,400 cubic feet or 400 board

feet (International rule) from an even-aged, fully stocked stand of trees 100 years old.

The potential understory plant community on this unit is mountain brome, dryland sedge, blue wildrye, and quaking aspen. The average annual production of air-dry vegetation ranges from 1,300 to 3,250 pounds. Management practices that maintain or improve the range vegetation include proper grazing use, planned grazing systems, fencing, and stock water development.

This map unit is in capability unit VIe-H, nonirrigated, and in woodland suitability group 4o2.

BB—Bear Lake silt loam. This very deep, very poorly drained soil is on flood plains of streams surrounding Bear Lake and on the Bear River flood plain. It formed in calcareous alluvium derived from mixed parent material. Slopes are 0 to 1 percent. They are long and slightly concave or convex. The present vegetation is mainly broadleaf sedges, tufted hairgrass, wiregrass, and foxtail. Elevation is 5,930 to 6,430 feet. The average annual precipitation is about 9 to 14 inches, the mean annual air temperature is 38 to 44 degrees F, and the average freeze-free season is 55 to 90 days.

Typically, the surface layer is black silt loam 16 inches thick. The upper 21 inches of the underlying material is gray silty clay loam, the next 11 inches is gray silt loam, and the lower part to a depth of 60 inches or more is brown very gravelly loamy sand.

Included in this unit are about 6 percent Canburn silt loam; 6 percent Nevka loam, wet; 5 percent Bear Lake silt loam, ponded, in slightly concave old stream channels; and 3 percent soils that are similar to this Bear Lake soil but are more than 35 percent clay. These soils are scattered throughout the unit.

Permeability of this Bear Lake soil is slow. Available water capacity is about 7.5 to 10.0 inches. Effective rooting depth is limited by a seasonal high water table that is at a depth of 0 to 24 inches from April to July. Runoff is very slow, and the hazard of water erosion is slight. The soil is subject to brief periods of flooding in summer.

Most areas of this unit are used for irrigated hay and pasture and for wildlife habitat. A few areas are used as homesites.

If this unit is used for irrigated hay and pasture, the main limitations are the high water table and a short growing season. If drainage is not provided, plants that tolerate a seasonal high water table should be selected. If this unit is irrigated, it produces about 6 animal-unit-months of forage per acre.

Population growth has resulted in increased construction of homes on this unit. The main limitations for use of this unit as homesites are the high water table, slow permeability, and the hazard of flooding. Drainage is needed if roads and building foundations are constructed.

Slow permeability and the high water table increase the possibility of failure of septic tank absorption fields.

This map unit is in capability unit VIw-45, irrigated.

BC—Bear Lake silt loam, ponded. This very deep, very poorly drained soil is on old stream channels and in shallow depressional areas of the Bear River flood plain. It formed in alluvium derived from mixed parent material. Slopes are 0 to 1 percent. They are long and slightly concave. The present vegetation is mainly cattails, bulrushes, wiregrass, and broadleaf sedges. Elevation is 6,200 to 6,400 feet. The average annual precipitation is about 9 to 11 inches, the mean annual air temperature is 38 to 42 degrees F, and the average freeze-free season is 55 to 65 days.

Typically, the surface layer is very dark grayish brown silt loam about 8 inches thick. The upper 14 inches of the underlying material is gray silt loam, and the lower part to a depth of 60 inches or more is dark gray and gray silty clay loam.

Included in this unit are about 2 percent Bear Lake silt loam, 2 percent Canburn silt loam, and 2 percent Saleratus loam. These included soils are in the slightly higher lying areas.

Permeability of this Bear Lake soil is slow. The soil is subject to very long periods of ponding from May through July. Water is on or near the surface during most of the growing season. The soil is subject to flooding in summer.

This unit is used mainly for wildlife habitat. It is also used for native hay and pasture in some droughty years.

This map unit is in capability unit VIIw-45, irrigated.

BD—Bear Lake silty clay loam, saline-alkali. This very deep, poorly drained soil is on flood plains of the Bear River. It formed in calcareous alluvium derived from mixed parent material. Slopes are 0 to 1 percent. They are long and slightly concave or convex. The present vegetation is mainly saltgrass, foxtail, wiregrass, and broadleaf sedges. Elevation is 6,200 to 6,400 feet. The average annual precipitation is about 9 to 11 inches, the mean annual air temperature is 38 to 42 degrees F, and the average freeze-free season is 55 to 65 days.

Typically, the surface layer is black silty clay loam about 16 inches thick. The upper 18 inches of the underlying material is gray and dark gray silty clay loam, and the lower part to a depth of 60 inches or more is light gray silty clay loam.

Included in this unit are about 8 percent Bear Lake silt loam in shallow depressional areas; 6 percent Nevka loam in the slightly higher lying areas; 4 percent Nevka loam, wet, in shallow depressional areas; and 2 percent Bear Lake silt loam, ponded, in old stream channels.

Permeability of this Bear Lake soil is slow. Available water capacity is about 8.0 to 9.5 inches. Effective rooting depth is limited by a seasonal high water table that is at a depth of 10 to 24 inches from May to July.

Runoff is very slow. The soil is subject to flooding in summer.

This unit is used for irrigated hay and pasture and wildlife habitat.

This unit is poorly suited to hay and pasture. The concentration of salts and alkali in the surface layer limits the production of plants suitable for hay and pasture. Leaching of the salts is limited by the high water table. Drainage and proper irrigation water management, however, reduce the concentration of salts. Salt-tolerant species are most suitable for planting. If this unit is irrigated, it produces about 5 animal-unit-months of forage per acre.

This map unit is in capability unit VIw-458, irrigated.

BEF—Bequinn very gravelly loam, 30 to 50 percent slopes. This very deep, well drained soil is on mountainsides, mainly in the northeastern part of Rich County. It formed in colluvium derived dominantly from conglomerate. Slopes are long and concave or convex. They face east, west, and south. The present vegetation is mainly big sagebrush, bluebunch wheatgrass, lanceleaf yellowbrush, and pricklypear. Elevation is 6,200 to 7,500 feet. The average annual precipitation is about 9 to 13 inches, the mean annual air temperature is 36 to 40 degrees F, and the average freeze-free season is 50 to 65 days.

Typically, the surface layer is dark brown very gravelly loam about 5 inches thick. The upper 21 inches of the underlying material is brown very gravelly loam and pale brown very gravelly sandy loam, and the lower part to a depth of 60 inches or more is light brownish gray extremely gravelly loamy sand.

Included in this unit are about 9 percent Dagan gravelly silt loam, 25 to 40 percent slopes, on north-facing side slopes; 5 percent Duckree gravelly silt loam, 15 to 40 percent slopes; and 1 percent Solak gravelly loam, 10 to 50 percent slopes, on ridges.

Permeability of this Bequinn soil is moderate. Available water capacity is about 3.5 to 4.5 inches. Water supplying capacity is 5.5 to 7.0 inches. Effective rooting depth is 60 inches or more. Runoff is rapid, and the hazard of water erosion is high.

This unit is used as rangeland and for wildlife habitat.

The potential plant community on this unit is mainly Indian ricegrass, bluebunch wheatgrass, big sagebrush, and Sandberg bluegrass. The unit is poorly suited to rangeland seeding. The main limitations are slope and the low available water capacity of the soil.

Management practices that maintain or improve the range vegetation include proper grazing use, planned grazing systems, fencing, and stock water developments. Shrubs can be controlled by chemical treatment.

This map unit is in capability unit VIIe-S4, nonirrigated, and in Semidesert Stony Loam range site.

BFB—Bereniceton silt loam, cool, 1 to 3 percent slopes. This very deep, well drained soil is on alluvial fans and terraces adjacent to the Bear River flood plain. It formed in alluvium derived dominantly from sandstone and limestone. Slopes are long and slightly concave or convex. They dominantly face west. The present vegetation is mainly big sagebrush, Nuttall saltbush, western wheatgrass, and Sandberg bluegrass. Elevation is 6,200 to 6,300 feet. The average annual precipitation is about 9 to 11 inches, the mean annual air temperature is 38 to 42 degrees F, and the average freeze-free season is 55 to 65 days.

Typically, the surface layer is pale brown silt loam 8 inches thick. The upper 37 inches of the underlying material is brown and light yellowish brown loam, and the lower part to a depth of 60 inches or more is light yellowish brown silty clay loam.

Included in this unit are about 7 percent Bockston loam, cool, 0 to 3 percent slopes, on foothills at the top of fans; 6 percent Cowco loam, 0 to 3 percent slopes, in areas of more recent deposits along stream channels; 2 percent Ramshorn gravelly loam, 8 to 15 percent slopes, on mountain toe slopes; and 5 percent soils that are similar to this Bereniceton soil but are more than 35 percent clay in the lower part and are in the lower lying areas of alluvial fans.

Permeability of this Bereniceton soil is moderately slow. Available water capacity is about 10 to 11 inches. Water supplying capacity is 6 to 8 inches. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is moderate. The soil is subject to rare periods of flooding.

This unit is used mainly as rangeland and for wildlife habitat. It is also used for irrigated crops.

The potential plant community on this unit is mainly bluebunch wheatgrass, needleandthread, big sagebrush, and bottlebrush squirreltail. The suitability of the unit for rangeland seeding is fair. The main limitation is low precipitation.

Management practices suitable for use on this unit are proper grazing use and planned grazing systems. Shrubs can be controlled by chemical treatment, mechanical treatment, or prescribed burning.

This unit is well suited to irrigated alfalfa and small grain. The main limitation is the short growing season. Maintaining crop residue on or near the surface reduces runoff, reduces erosion, and helps to maintain soil tilth and organic matter content. Tillage should be kept to a minimum. If this unit is irrigated, it produces about 3.5 tons of alfalfa per acre, about 70 bushels of barley per acre, or about 6 animal-unit-months of forage per acre.

This map unit is in capability units IVc-4, irrigated, and VIc-S, nonirrigated. It is in Semidesert Loam range site.

BGE—Bereniceton gravelly loam, cool, 15 to 25 percent slopes. This very deep, well drained soil is on alluvial fans east of the Crawford Mountains and

southwest of Woodruff. It formed in alluvium derived dominantly from sandstone. Slopes are short or medium in length and are slightly convex. They dominantly face south. The present vegetation is mainly black sagebrush, Sandberg bluegrass, bluebunch wheatgrass, and pricklypear. Elevation is 6,400 to 6,700 feet. The average annual precipitation is about 9 to 11 inches, the mean annual air temperature is 38 to 42 degrees F, and the average freeze-free season is 55 to 65 days.

Typically, the surface layer is yellowish brown gravelly loam about 6 inches thick. The upper 22 inches of the underlying material is pale brown silt loam, and the lower part to a depth of 60 inches or more is very pale brown silty clay loam.

Included in this unit are about 7 percent Zagg gravelly clay loam that has slopes of 4 to 15 percent; 5 percent Pancheri silt loam, cool, 10 to 20 percent slopes, eroded; and 3 percent soils that are similar to this Bereniceton soil but are more than 35 percent clay in the lower part. These soils are scattered throughout the unit.

Permeability of this Bereniceton soil is moderately slow. Available water capacity is about 9 to 11 inches. Water supplying capacity is 6 to 7 inches. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is high.

This unit is used as rangeland and for wildlife habitat.

The potential plant community on this unit is mainly bluebunch wheatgrass, needleandthread, big sagebrush, and bottlebrush squirreltail. The suitability of the unit for rangeland seeding is fair. The main limitations are low precipitation, slope, and rock fragments in the surface layer.

Practices suitable for use on this unit are proper grazing use and planned grazing systems. Shrubs can be controlled by chemical treatment or prescribed burning.

This map unit is in capability unit VIe-S, nonirrigated, and in Semidesert Loam range site.

BHA—Bockston loam, cool, 0 to 3 percent slopes. This very deep, well drained soil is on flood plains, alluvial fans, and stream terraces along the Bear River and other major streams in the survey area. It formed in alluvium derived from mixed parent material. Slopes are long and slightly concave or convex. They face north and east. The present vegetation is mainly big sagebrush, Sandberg bluegrass, western wheatgrass, and lanceleaf yellowbrush. Elevation is 6,200 to 6,400 feet. The average annual precipitation is about 9 to 11 inches, the mean annual air temperature is 38 to 42 degrees F, and the average freeze-free season is 55 to 65 days.

Typically, the surface layer is brown loam 8 inches thick. The subsoil is brown silt loam 9 inches thick. The upper 7 inches of the substratum is pink loam, the next 16 inches is light brown fine sandy loam, and the lower part to a depth of 60 inches or more is light brown very gravelly loamy fine sand. A layer of carbonate accumulation is between depths of 17 and 34 inches.

Included in this unit are about 10 percent soils, scattered throughout the unit, that are similar to this Bockston soil but do not have a dark-colored surface layer; 6 percent Cowco loam, 0 to 3 percent slopes, in areas of more recent deposits near stream channels; 3 percent Duckree loam, 0 to 3 percent slopes, along the edges of flood plains; and 1 percent Wader loam in shallow depressional areas.

Permeability of this Bockston soil is moderate. Available water capacity is about 7.5 to 10.0 inches. Water supplying capacity is 6 to 8 inches. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. This soil is subject to rare periods of flooding. A seasonal high water table is at a depth of 5 to 6 feet in some areas near perennial streams.

This unit is used mainly as rangeland, for irrigated crops, and for wildlife habitat. It is also used as homesites.

The potential plant community on this unit is mainly bluebunch wheatgrass, needleandthread, big sagebrush, and bottlebrush squirreltail. The suitability of the unit for rangeland seeding is fair. The main limitation is low precipitation.

Management practices suitable for use on this unit are proper grazing use and planned grazing systems. Shrubs can be controlled by chemical treatment, mechanical treatment, or prescribed burning.

This unit is well suited to irrigated alfalfa and small grain. The main limitation is a short growing season. Maintaining crop residue on or near the surface reduces runoff, reduces soil blowing, and helps to maintain soil tilth and organic matter content. Tillage should be kept to a minimum. If this unit is irrigated, it produces about 3 tons of alfalfa per acre, about 6.5 bushels of barley per acre, or about 6 animal-unit-months of forage per acre.

This unit is poorly suited to homesite development. The main limitation is the hazard of flooding in areas that are not protected. In summer, irrigation is needed for lawn grasses, shrubs, vines, shade trees, and ornamental trees.

This map unit is in capability units IVc-4, irrigated, and VIc-S, nonirrigated. It is in Semidesert Loam range site.

BHB—Bockston loam, cool, 3 to 6 percent slopes. This very deep, well drained soil is on alluvial fans and stream terraces of the Bear River and other major streams. It formed in alluvium derived from mixed parent material. Slopes are medium in length and are plane or slightly convex. The present vegetation is mainly big sagebrush, lanceleaf yellowbrush, and western wheatgrass. Elevation is 6,200 to 6,400 feet. The average annual precipitation is about 9 to 11 inches, the mean annual air temperature is 38 to 42 degrees F, and the average freeze-free season is 55 to 65 days.

Typically, the surface layer is brown loam about 7 inches thick. The subsoil is brown loam about 8 inches thick. The upper 28 inches of the substratum is light brown and pink loam, and the lower part to a depth of 60 inches or more is pink gravelly sandy loam. A layer of carbonate accumulation is between depths of 15 and 43 inches.

Included in this unit are about 8 percent soils, scattered throughout the unit, that are similar to this Bockston soil but do not have a dark-colored surface layer; 5 percent Cowco loam, 3 to 6 percent slopes, in areas of more recent deposits near stream channels; and 2 percent soils that are similar to this Bockston soil but have slopes of 6 to 15 percent and are in areas where stream terraces meet uplands.

Permeability of this Bockston soil is moderate. Available water capacity is about 6.5 to 7.5 inches. Water supplying capacity is 6 to 7 inches. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight.

This unit is used for irrigated crops, rangeland, wildlife habitat, and homesite development.

This unit is well suited to irrigated alfalfa and small grain. The main limitation is a short growing season. Tilth and fertility can be improved by returning crop residue to the soil. Tillage should be kept to a minimum. If this unit is irrigated, it produces about 3 tons of alfalfa per acre or about 65 tons of barley per acre.

The potential plant community on this unit is mainly bluebunch wheatgrass, needleandthread, big sagebrush, and bottlebrush squirreltail. The suitability of the soil in the unit for rangeland seeding is fair. The main limitation is low precipitation.

Practices suitable for use on this unit are proper grazing use and planned grazing systems. Shrubs can be controlled by chemical treatment, mechanical treatment, or prescribed burning.

This unit is well suited to homesite development. In summer, irrigation is needed for lawn grasses, shrubs, vines, shade trees, and ornamental trees.

This map unit is in capability units IVe-4, irrigated, and IVe-S, nonirrigated. It is in Semidesert Loam range site.

BJC—Bullnel loam, 4 to 15 percent slopes. This moderately deep, well drained soil is on plateaus and foothills in the southwestern part of Rich County. It formed in residuum and colluvium derived dominantly from sandstone and shale. Slopes are long and concave or convex. They dominantly face north. The present vegetation is mainly lanceleaf yellowbrush, needleandthread, big sagebrush, and Nevada bluegrass. Elevation is 7,000 to 7,600 feet. The average annual precipitation is about 15 to 18 inches, the mean annual air temperature is 35 to 38 degrees F, and the average freeze-free season is 70 to 90 days.

Typically, the surface layer is dark reddish brown loam about 11 inches thick. The subsoil is dark red silty clay loam and gravelly clay loam about 24 inches thick. The substratum is dark red loam 4 inches thick. Soft sandstone is at a depth of 39 inches. Depth to bedrock ranges from 20 to 40 inches.

Included in this unit are about 20 percent soils that are similar to this Bullnel soil but are more than 40 inches deep to bedrock; 3 percent Etchen very cobbly loam, 25 to 40 percent slopes, on steep south- and west-facing side slopes; and 4 percent Cutoff gravelly loam, 6 to 25 percent slopes. Also included are small areas of Baird Hollow silt loam, 10 to 25 percent slopes; Bullnel loam, 15 to 30 percent slopes; and Ercan loam, 3 to 15 percent slopes. These soils are intermingled throughout the unit.

Permeability of this Bullnel soil is moderately slow. Available water capacity is about 5.5 to 7.0 inches. Water supplying capacity is 8 to 11 inches. Effective rooting depth is 20 to 40 inches. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used as rangeland and for wildlife habitat.

The potential plant community on this unit is mainly bluebunch wheatgrass, Nevada bluegrass, birchleaf mountainmahogany, and muttongrass. The suitability of the soil in the unit for rangeland seeding is fair. The main limitations are depth to bedrock and slope.

Practices suitable for use on this unit are proper grazing use and planned grazing systems. Shrubs can be controlled by chemical treatment, mechanical treatment, or prescribed burning.

This map unit is in capability unit VIe-M, nonirrigated, and in Mountain Gravelly Loam range site.

BJE—Bullnel loam, 15 to 30 percent slopes. This moderately deep, well drained soil is on foothills and mountainsides in the southwestern part of Rich County. It formed in residuum and colluvium derived dominantly from sandstone and shale. Slopes are long and convex or concave. They dominantly face north. The present vegetation is mainly western wheatgrass, lanceleaf yellowbrush, big sagebrush, and mountain snowberry. Elevation is 6,800 to 7,850 feet. The average annual precipitation is about 15 to 20 inches, the mean annual air temperature is 35 to 38 degrees F, and the average freeze-free season is 70 to 90 days.

Typically, the surface layer is dark brown loam about 12 inches thick. The subsoil is red gravelly loam about 19 inches thick. The substratum is red very cobbly loam 8 inches thick. Soft sandstone is at a depth of 39 inches. Depth to bedrock ranges from 20 to 40 inches.

Included in this unit are about 4 percent Bullnel loam, 4 to 15 percent slopes, on ridgetops; 3 percent Ercan loam, 15 to 30 percent slopes, that is on north- and east-facing side slopes and supports aspen; 3 percent Etchen very cobbly loam, 25 to 40 percent slopes, on south- and west-facing side slopes; and 3 percent Cutoff gravelly loam, 25 to 60 percent slopes, on south-facing

side slopes. Also included are small areas of Guilder loam, 15 to 25 percent slopes.

Permeability of this Bullnel soil is moderately slow. Available water capacity is about 5 to 6 inches. Water supplying capacity is 8 to 11 inches. Effective rooting depth is 20 to 40 inches. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used as rangeland and for wildlife habitat.

The potential plant community on this unit is mainly bluebunch wheatgrass, Nevada bluegrass, birchleaf mountainmahogany, and muttongrass. The suitability of the soil in the unit for rangeland seeding is poor. The main limitations are depth to bedrock and slope.

Practices suitable for use on this unit are proper grazing use and planned grazing systems. Shrubs can be controlled by chemical treatment or prescribed burning.

This map unit is in capability unit VIe-M, nonirrigated, and in Mountain Gravelly Loam range site.

CA—Canburn silt loam. This very deep, poorly drained soil is on flood plains of major streams. It formed in alluvium derived from mixed parent material. Slopes are 0 to 1 percent and are long. The present vegetation is mainly wiregrass, broadleaf sedges, Kentucky bluegrass, and clover. Elevation is 5,930 to 6,350 feet. The average annual precipitation is about 9 to 14 inches, the mean annual air temperature is 38 to 44 degrees F, and the average freeze-free season is 55 to 90 days.

Typically, the surface is covered with a mat of partially decomposed leaves, stems, and roots 2 inches thick. The surface layer is very dark gray silt loam 24 inches thick. The underlying material to a depth of 60 inches or more is light gray and very pale brown loam.

Included in this unit are about 10 percent Bear Lake silt loam in areas intermingled throughout the unit; 7 percent Nevka loam, wet, in the slightly higher lying areas; and 3 percent Bear Lake silt loam, ponded, in old stream channels and in shallow depressional areas.

Permeability of this Canburn soil is moderately slow. Available water capacity is about 10 to 11 inches. Effective rooting depth is limited by a seasonal high water table that is at a depth of 0 to 18 inches from March to July. Runoff is very slow. The soil is subject to frequent periods of flooding.

This unit is used for irrigated hay and pasture and for wildlife habitat.

If this unit is used for irrigated hay and pasture, the main limitations are the high water table and a short growing season. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and to protect the soil from erosion. If this unit is irrigated, it produces about 6 animal-unit-months of forage per acre.

This map unit is in capability unit VIw-4, irrigated.

CBD—Cloud Rim, dry-McCarey loams, 4 to 15 percent slopes. This map unit is on foothills and alluvial fans, mainly west of Bear Lake. Slopes are long, convex or concave, and dominantly east-facing. The present vegetation is mainly big sagebrush, bluebunch wheatgrass, slender wheatgrass, and serviceberry. Elevation is 6,000 to 7,000 feet. The average annual precipitation is about 14 to 16 inches, the mean annual air temperature is 38 to 42 degrees F, and the average freeze-free season is 75 to 90 days.

This unit is 50 percent Cloud Rim loam, dry, and 35 percent McCarey loam. The Cloud Rim soil is on alluvial fans and the lower parts of foothills, and the McCarey soil is on the higher parts of foothills. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are about 8 percent Thatcher silt loam, warm, 3 to 6 percent slopes, on alluvial fans; 4 percent Ant Flat silt loam, dry, 10 to 25 percent slopes, on foothills; and 3 percent Yeates Hollow stony loam that has slopes of 6 to 25 percent and is on foothills. Included areas make up about 15 percent of the total acreage.

The Cloud Rim soil is very deep and well drained. It formed in alluvium and colluvium derived dominantly from sandstone and quartzite. Typically, the surface layer is very dark grayish brown loam 13 inches thick. The subsoil is dark brown silty clay loam 44 inches thick. The substratum to a depth of 70 inches or more is dark brown loam.

Permeability of the Cloud Rim soil is moderately slow. Available water capacity is about 10 to 11 inches. Water supplying capacity is 11 to 12 inches. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate.

The McCarey soil is moderately deep and well drained. It formed in colluvium and residuum derived dominantly from conglomerate. Typically, the surface layer is very dark grayish brown loam 10 inches thick. The subsoil is dark yellowish brown and dark brown clay loam 12 inches thick. The substratum is dark red sandy loam 7 inches thick. Conglomerate is at a depth of 29 inches. Depth to conglomerate ranges from 25 to 40 inches.

Permeability of the McCarey soil is moderately slow. Available water capacity is about 4 to 6 inches. Water supplying capacity is 7 to 9 inches. Effective rooting depth is 25 to 40 inches. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used mainly as rangeland, as irrigated and nonirrigated cropland, and for wildlife habitat. It is also used for homesite development. The main irrigated crops are alfalfa and small grain, and the main nonirrigated crop is small grain.

The potential plant community on the Cloud Rim soil is mainly bluebunch wheatgrass, antelope bitterbrush, Indian ricegrass, and big sagebrush. The suitability of this soil for rangeland seeding is good.

The potential plant community on the McCarey soil is mainly bluebunch wheatgrass, antelope bitterbrush,

Nevada bluegrass, and big sagebrush. The suitability of this soil for rangeland seeding is fair. The main limitations are low available water capacity and restricted rooting depth.

Practices suitable for use on this unit are proper grazing use and planned grazing systems. Shrubs can be controlled by chemical treatment, mechanical treatment, or prescribed burning.

This unit is well suited to irrigated and nonirrigated crops. A crop-fallow system should be used if nonirrigated small grain is grown. Seedbed preparation should be on the contour or across the slope where practical. Maintaining crop residue on or near the surface reduces runoff, reduces erosion, and helps to maintain soil tilth and organic matter content. Tillage should be kept to a minimum. Sprinklers should be used to irrigate the soils in this unit. If this unit is irrigated, it produces about 3 tons of alfalfa per acre or 80 bushels of barley per acre.

Population growth has resulted in increased construction of homes on this unit. The Cloud Rim soil is well suited to homesite development. The main limitations are slopes of more than 8 percent 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 the McCarey soil is used for homesite development, the main limitations are depth to bedrock and slopes of more than 8 percent. Cuts needed to provide essentially level building sites can expose bedrock. Depth to bedrock is also a limitation for septic tank absorption fields.

The map unit is in capability units IVe-3, irrigated, and VIe-U, nonirrigated. The Cloud Rim soil is in Upland Loam range site, and the McCarey soil is in Upland Stony Loam range site.

CCE—Cluff gravelly loam, 10 to 40 percent slopes. This deep, well drained soil is on hilly mountain ridges and side slopes along the southwestern boundary of Rich County. It formed in residuum and colluvium derived dominantly from sandstone. Slopes are long and convex or concave. The present vegetation is mainly Engelmann spruce and aspen with an understory of slender wheatgrass and aspen peavine. Elevation is 7,800 to 8,900 feet. The average annual precipitation is about 25 to 35 inches, the mean annual air temperature is 32 to 38 degrees F, and the average freeze-free season is 40 to 55 days.

Typically, the upper 4 inches of the surface layer is dark brown gravelly loam and the lower 10 inches is dark yellowish brown very gravelly loam. The subsurface layer is brown extremely gravelly sandy clay loam 6 inches thick. The subsoil is yellowish red extremely gravelly clay loam 21 inches thick. Sandstone is at a depth of 41 inches. Depth to sandstone ranges from 40 to 60 inches.

Included in this unit are about 10 percent Yeljack loam, north, 10 to 30 percent slopes, under stands of dominantly aspen and 5 percent Yeljack loam, 6 to 25 percent slopes, under shrubs, forbs, and grasses.

Permeability of this Cluff soil is moderately slow. Available water capacity is about 5 to 7 inches. Water supplying capacity is 12 to 15 inches. Effective rooting depth is 40 to 60 inches. Runoff is slow, and the hazard of water erosion is slight.

This unit is used mainly for timber production and wildlife habitat. It is also used as rangeland.

Management practices and capability classification are not provided for this unit (all in National Forest).

CDD—Condie gravelly loam, 6 to 25 percent slopes. This very deep, well drained soil is on mountainsides south and west of Bear Lake. It formed in colluvium derived dominantly from conglomerate composed of sandstone and quartzite. Slopes are long, convex or concave, and dominantly face north. The present vegetation is mainly Douglas-fir and lodgepole pine with an understory of snowberry, pinegrass, and myrtle pachystima. Elevation is 7,000 to 8,500 feet. The average annual precipitation is about 25 to 35 inches, the mean annual air temperature is 34 to 38 degrees F, and the average freeze-free season is 50 to 65 days.

Typically, the surface is covered with a mat of partially decomposed needles, leaves, and twigs 3 inches thick. The surface layer is dark brown gravelly loam 4 inches thick. The subsurface layer is brown gravelly fine sandy loam 27 inches thick. The subsoil to a depth of 60 inches or more is reddish brown very gravelly clay loam.

Included in this unit are about 5 percent Lucky Star gravelly loam, 8 to 25 percent slopes, under stands of aspen; 5 percent Yeljack loam, 6 to 25 percent slopes, under sagebrush and grass; and 2 percent soils, intermingled throughout the unit, that are similar to this Condie soil but are less than 40 inches deep to bedrock.

Permeability of this Condie soil is moderately slow. Available water capacity is about 5 to 7 inches. Water supplying capacity is 11 to 14 inches. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used as woodland and for wildlife habitat.

This unit is poorly suited to Douglas-fir and lodgepole pine. Based on a site index of 55, the potential production per acre of merchantable timber is 1,400 cubic feet or 5,600 board feet (International rule) from an even-aged, fully stocked stand of trees 100 years old.

This map unit is in capability unit VIe-HC, nonirrigated, and in woodland suitability group 4f3.

CDE—Condie gravelly loam, 25 to 40 percent slopes. This very deep, well drained soil is on mountainsides south and west of Bear Lake. It formed in colluvium derived dominantly from conglomerate composed of sandstone and quartzite. Slopes are long,

convex or concave, and dominantly face north. The present vegetation is mainly lodgepole pine and Douglas-fir with an understory of snowberry, myrtle pachystima, and pinegrass. Elevation is 7,000 to 8,500 feet. The average annual precipitation is about 25 to 35 inches, the mean annual air temperature is 34 to 38 degrees F, and the average freeze-free season is 50 to 65 days.

Typically, the surface is covered with a mat of partially decomposed needles, leaves, and twigs 3 inches thick. The surface layer is dark brown gravelly loam 5 inches thick. The subsurface layer is brown gravelly fine sandy loam 15 inches thick. The subsoil is yellowish red extremely gravelly clay loam 20 inches thick. The substratum to a depth of 60 inches or more is red very gravelly fine sandy loam.

Included in this unit are about 5 percent Lucky Star gravelly loam, 25 to 60 percent slopes, under stands of aspen; 5 percent Yeljack loam, 6 to 25 percent slopes, under grass and sagebrush; and 2 percent soils, intermingled throughout the unit, that are similar to this Condie soil but are less than 40 inches deep to bedrock.

Permeability of this Condie soil is moderately slow. Available water capacity is about 5 to 7 inches. Water supplying capacity is 11 to 14 inches. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used as woodland and for wildlife habitat.

This unit is poorly suited to Douglas-fir and lodgepole pine. Based on a site index of 55, the potential production per acre of merchantable timber is 1,400 cubic feet or 5,600 board feet (International rule, one-fourth inch kerf) from an even-aged, fully stocked stand of trees 100 years old.

This map unit is in capability unit VIe-HC, nonirrigated, and in woodland suitability group 4f3.

CEA—Cowco loam, 0 to 3 percent slopes. This very deep, well drained soil is on flood plains and alluvial fans in the eastern half of Rich County. It formed in alluvium derived from mixed parent material. Slopes are long and are plane to slightly convex. The present vegetation is mainly big sagebrush, lanceleaf yellowbrush, western wheatgrass, and Nevada bluegrass. Elevation is 6,200 to 6,500 feet. The average annual precipitation is about 9 to 11 inches, the mean annual air temperature is 38 to 42 degrees F, and the average freeze-free season is 55 to 65 days.

Typically, the surface layer is brown loam 8 inches thick. The upper 9 inches of the underlying material is brown loam, and the lower part to a depth of 60 inches or more is light reddish brown and reddish brown silty clay loam.

Included in this unit are about 10 percent Bereniceton silt loam, cool, 1 to 3 percent slopes, in the slightly higher lying areas; 4 percent Bockston loam, cool, 0 to 3 percent slopes, in the slightly higher lying areas; 3 percent Saleratus loam in slightly concave areas of flood plains; and 2 percent Duckree loam, 0 to 3 percent slopes, near the edges of flood plains and fans. Also included are small areas of very deep, well drained, medium textured soils that have a layer of clay accumulation and are intermingled throughout the unit.

Permeability of this Cowco soil is slow. Available water capacity is about 7.5 to 10.0 inches. Water supplying capacity is 6 to 8 inches. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. A seasonal high water table is at a depth of 5 to 6 feet in some areas near perennial streams. The soil is subject to rare periods of flooding.

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

This unit is well suited to irrigated alfalfa and small grain and to irrigated hay and pasture. The main limitation is a short growing season. Tilth and fertility can be improved by returning crop residue to the soil. Maintaining crop residue on or near the surface reduces soil blowing, reduces runoff, and helps to maintain soil tilth and organic matter content. Tillage should be kept to a minimum. If this unit is irrigated, it produces about 3 tons of alfalfa per acre, about 65 bushels of barley per acre, or about 6 animal-unit-months of forage per acre.

The potential plant community on this unit is mainly bluebunch wheatgrass, needleandthread, big sagebrush, and bottlebrush squirreltail. The suitability of the unit for rangeland seeding is fair. The main limitation is low precipitation.

Management practices suitable for use on this unit are proper grazing use and planned grazing systems. Shrubs can be controlled by chemical treatment, mechanical treatment, or prescribed burning.

If this unit is used for homesite development, the main limitation is the hazard of flooding in unprotected areas.

This map unit is in capability units IVc-4, irrigated, and VIc-S, nonirrigated. It is in Semidesert Loam range site.

CEB—Cowco loam, 3 to 6 percent slopes. This very deep, well drained soil is on flood plains and alluvial fans in the eastern half of Rich County. It formed in alluvium derived from mixed parent material. Slopes are medium or long and are plane to slightly convex. The present vegetation is mainly big sagebrush, lanceleaf yellowbrush, and western wheatgrass. Elevation is 6,200 to 6,500 feet. The average annual precipitation is about 9 to 11 inches, the mean annual air temperature is 38 to 42 degrees F, and the average freeze-free season is 55 to 65 days.

Typically, the surface layer is brown loam about 9 inches thick. The upper 33 inches of the underlying material is brown silt loam and silty clay loam, and the lower part to a depth of 60 inches or more is light brown loam.

Included in this unit are about 10 percent very deep, well drained, medium textured soils that have a layer of calcium carbonate accumulation and are in slightly higher lying areas; 5 percent Bockston loam, cool, 3 to 6 percent slopes, in slightly higher lying areas; 3 percent soils that have a layer of clay accumulation and are intermingled throughout the unit; and 2 percent soils that are similar to this Cowco soil but have slopes of more than 6 percent.

Permeability of this Cowco soil is slow. Available water capacity is about 10 to 11 inches. Water supplying capacity is 6 to 8 inches. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used mainly as rangeland and for wildlife habitat. Some areas are used for irrigated crops.

The potential plant community on this unit is mainly bluebunch wheatgrass, needleandthread, big sagebrush, and bottlebrush squirreltail. The suitability of the soil in the unit for rangeland seeding is fair. The main limitation is low precipitation.

Practices suitable for use on this unit are proper grazing use and planned grazing systems. Shrubs can be controlled by chemical treatment, mechanical treatment, or prescribed burning.

This unit is well suited to irrigated alfalfa and small grain. The main limitation is a short growing season. Crop residue left on or near the surface helps to conserve moisture, maintain tilth, and control erosion. Tillage should be kept to a minimum. If this unit is irrigated, it produces about 3 tons of alfalfa per acre or about 65 bushels of barley per acre.

This unit is in capability units IVe-4, irrigated, and VIe-S, nonirrigated. It is in the Semidesert Loam range site.

CFA—Cowco silty clay loam, saline-alkali, 0 to 3 percent slopes. This very deep, well drained soil is on flood plains and alluvial fans near Saleratus Creek. It formed in alluvium derived from mixed parent material. Slopes are long and slightly concave or convex. The present vegetation is mainly greasewood, saltgrass, alkali sacaton, and big sagebrush. Elevation is 6,300 to 6,400 feet. The average annual precipitation is about 9 to 11 inches, the mean annual air temperature is 38 to 42 degrees F, and the average freeze-free season is 55 to 65 days.

Typically, the surface layer is reddish brown silty clay loam about 6 inches thick. The upper 21 inches of the underlying material is reddish brown and yellowish red silty clay loam. The lower part to a depth of 60 inches or more is reddish brown and reddish yellow silty clay loam.

Included in this unit are about 9 percent Saleratus loam, saline-alkali, in lower lying areas of flood plains; 6 percent Hival silty clay loam in lower lying areas of flood plains; 3 percent Saleratus soils in lower lying areas; and 2 percent Cowco loam, 0 to 3 percent slopes, in the more gently sloping areas.

Permeability of this Cowco soil is slow. Available water capacity is about 8 to 9 inches. Water supplying capacity is 6 to 8 inches. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight.

Most areas of this unit are used as rangeland and irrigated cropland and for wildlife habitat. A few areas are used for irrigated hay and pasture. Crops commonly grown are alfalfa, barley, and oats.

If this unit is used for irrigated crops or hay and pasture, the main limitations are the content of salt in the soil, slow permeability, and a short growing season. Intensive management is required to reduce the salinity and maintain soil productivity. Tilth and fertility can be improved by returning crop residue to the soil. If this unit is irrigated, it produces about 2 tons of alfalfa per acre, 50 bushels of barley per acre, or about 4 animal-unit-months of forage per acre.

The potential plant community on this unit is mainly saltgrass, alkali sacaton, alkali bluegrass, and basin wildrye. The unit is poorly suited to rangeland seeding. The main limitations are the content of salt in the soil and low precipitation.

Practices suitable for use on this unit are proper grazing use and planned grazing systems. Shrubs can be controlled by mechanical treatment.

This map unit is in capability units IVs-48, irrigated, and VIIs-4, nonirrigated. It is in the Alkali Bottoms range site.

CGD—Cutoff gravelly loam, 6 to 25 percent slopes. This moderately deep, well drained soil is on foothills in the west-central and southwestern parts of Rich County. It formed in residuum and colluvium derived dominantly from sandstone. Slopes are medium to long and are slightly convex. They dominantly face east and south. The present vegetation is mainly big sagebrush, lanceleaf yellowbrush, antelope bitterbrush, and Sandberg bluegrass. Elevation is 6,600 to 7,900 feet. The average annual precipitation is about 13 to 17 inches, the mean annual air temperature is 35 to 39 degrees F, and the average freeze-free season is 60 to 80 days.

Typically, the surface layer is dark reddish brown gravelly loam about 9 inches thick. The subsoil is reddish brown very cobbly loam about 13 inches thick. The substratum is yellowish red extremely cobbly loam 4 inches thick. Fractured sandstone is at a depth of about 26 inches. Depth to sandstone ranges from 20 to 40 inches.

Included in this unit are about 6 percent Richville loam, dry, 8 to 15 percent slopes, on short north-facing side slopes; 4 percent Slinger gravelly loam, 25 to 40 percent slopes, on steep south-facing side slopes; 3 percent Cutoff gravelly loam, 25 to 60 percent slopes, on short, steep and very steep side slopes; and 2 percent Bullnel loam, 15 to 30 percent slopes, at the higher

elevations. Also included are small areas of Dennot loam, 25 to 40 percent slopes, on steep south-facing toe slopes and Baird Hollow silt loam, 10 to 25 percent slopes, that is in small pockets and is under stands of aspen. Included areas make up about 20 percent of the total acreage.

Permeability of this Cutoff soil is moderate. Available water capacity is about 2.5 to 3.5 inches. Water supplying capacity is 4.5 to 7.5 inches. Effective rooting depth is 20 to 40 inches. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used as rangeland and for wildlife habitat.

The potential plant community in this unit is mainly bluebunch wheatgrass, big sagebrush, black sagebrush, muttongrass, and antelope bitterbrush. The suitability of the unit for rangeland seeding is poor. The main limitations are low available water capacity and depth to bedrock.

Management practices suitable for use on this unit are proper grazing use and planned grazing systems. Shrubs can be controlled by chemical treatment or prescribed burning.

This map unit is in capability unit VIIs-U3, nonirrigated, and in Upland Stony Loam range site.

CGF—Cutoff gravelly loam, 25 to 60 percent slopes. This moderately deep, well drained soil is on foothills in the west-central and southwestern parts of Rich County. It formed in residuum and colluvium derived dominantly from sandstone. Slopes are medium to long and are convex or concave. They dominantly face south. The present vegetation is mainly big sagebrush, antelope bitterbrush, lanceleaf yellowbrush, and bluebunch wheatgrass. Elevation is 6,600 to 7,800 feet. The average annual precipitation is about 13 to 17 inches, the mean annual air temperature is 35 to 39 degrees F, and the average freeze-free season is 60 to 80 days.

Typically, the surface layer is dark reddish brown gravelly loam about 5 inches thick. The subsoil is red gravelly loam about 8 inches thick. The substratum is red very gravelly loam 22 inches thick. Fractured sandstone is at a depth of 35 inches. Depth to sandstone ranges from 20 to 40 inches.

Included in this unit are about 5 percent Etchen very cobbly loam, 25 to 40 percent slopes, mainly at the higher elevations; 5 percent Slinger gravelly loam, 25 to 40 percent slopes, that is in highly eroded areas and is under sparse stands of black sagebrush; 4 percent Dennot loam, 25 to 40 percent slopes, on north- and east-facing side slopes; and 3 percent Gridge stony loam that has slopes of 25 to 40 percent and is just above or just below ledges of Rock outcrop. Also included are small areas of Cutoff gravelly loam, 6 to 25 percent slopes, in the more gently sloping areas and Baird Hollow silt loam, 10 to 25 percent slopes, in small pockets and under stands of aspen. Included areas make up about 20 percent of the total acreage.

Permeability of this Cutoff soil is moderate. Available water capacity is about 3.5 to 4.5 inches. Water supplying capacity is 6 to 9 inches. Effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high.

This unit is used as rangeland and for wildlife habitat.

The potential plant community on this unit is mainly bluebunch wheatgrass, big sagebrush, black sagebrush, muttongrass, and antelope bitterbrush. The suitability of the unit for rangeland seeding is poor. The main limitation is slope.

Management practices suitable for use on this unit are proper grazing use and planned grazing systems. Shrubs can be controlled by chemical treatment.

This map unit is in capability unit VIIe-U3, nonirrigated, and in Upland Stony Loam range site.

CHF—Cutoff-Falula complex, 4 to 60 percent slopes. This map unit is on foothills northwest of Randolph. The present vegetation is mainly big sagebrush, snowberry, lanceleaf yellowbrush, and oniongrass. Elevation is 7,000 to 8,000 feet. The average annual precipitation is about 13 to 17 inches, the mean annual air temperature is 37 to 39 degrees F, and the average freeze-free season is 60 to 80 days.

This unit is 50 percent Cutoff gravelly loam, 25 to 60 percent slopes, and 35 percent Falula loam, 4 to 25 percent slopes. The Cutoff soil is on the lower foothills, and the Falula soil is near ridgetops on foothills. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are about 10 percent soils, on north- and northeast-facing slopes, that are similar to this Cutoff soil but have a darker colored surface layer and are under stands of aspen and conifers and 5 percent Rock outcrop on ridgetops.

The Cutoff soil is moderately deep and well drained. It formed in residuum and colluvium derived dominantly from sandstone. Slopes are long, convex or concave, and dominantly south-facing. Typically, the surface layer is dark brown gravelly loam 5 inches thick. The subsoil is yellowish red very gravelly loam 6 inches thick. The substratum is light reddish brown extremely cobbly loam 28 inches thick. Sandstone is at a depth of 39 inches. Depth to sandstone ranges from 20 to 40 inches.

Permeability of the Cutoff soil is moderate. Available water capacity is about 3.5 to 4.5 inches. Water supplying capacity is 6 to 9 inches. Effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high.

The Falula soil is shallow and somewhat excessively drained. It formed in residuum and colluvium derived dominantly from sandstone. Slopes are long, convex, and dominantly south- and east-facing. Typically, the surface layer is dark reddish brown gravelly loam 5 inches thick. The underlying material is red very gravelly

sandy loam 13 inches thick. Sandstone is at a depth of 18 inches. Depth to sandstone ranges from 10 to 20 inches.

Permeability of the Falula soil is moderate. Available water capacity is about 1 inch to 2 inches. Water supplying capacity is 2 to 5 inches. Effective rooting depth is 10 to 20 inches. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used as rangeland and for wildlife habitat.

The potential plant community on the Cutoff soil is mainly bluebunch wheatgrass, big sagebrush, black sagebrush, muttongrass, and antelope bitterbrush. The potential plant community on the Falula soil is mainly bluebunch wheatgrass, big sagebrush, black sagebrush, and Sandberg bluegrass. The soils in this unit are poorly suited to rangeland seeding. The main limitations are slope and depth to rock.

Management practices that maintain or improve the range vegetation include proper grazing use, planned grazing systems, fencing, and stock water development. Shrubs can be controlled by chemical treatment.

This map unit is in capability unit VIIe-U, nonirrigated. The Cutoff soil is in Upland Stony Loam range site, and the Falula soil is in Upland Shallow Loam range site.

DAF—Dagan gravelly loam, moist, 25 to 40 percent slopes. This deep, well drained soil is on mountainsides southwest of Bear Lake. It formed in colluvium derived dominantly from conglomerate composed of quartzite and sandstone. Slopes are long and are convex or concave. They face west. The present vegetation is mainly big sagebrush, snowberry, bluebunch wheatgrass, lanceleaf yellowbrush, and antelope bitterbrush. Elevation is 6,800 to 8,300 feet. The average annual precipitation is about 18 to 22 inches, the mean annual air temperature is 34 to 40 degrees F, and the average freeze-free season is 60 to 75 days.

Typically, the surface layer is very dark brown gravelly loam about 15 inches thick. The subsoil is brown very gravelly loam about 7 inches thick. The substratum is reddish brown extremely gravelly loam 28 inches thick. Weathered conglomerate is at a depth of 50 inches. A layer of secondary calcium carbonate accumulation is at a depth of about 34 inches. Depth to conglomerate ranges from 40 to 60 inches or more.

Included in this unit are about 10 percent Jebo very gravelly loam, 25 to 40 percent slopes, on ridgetops and 5 percent Yeates Hollow gravelly loam, 25 to 40 percent slopes, intermingled throughout the unit.

Permeability of this Dagan soil is moderate. Available water capacity is about 4 to 5 inches. Water supplying capacity is 10 to 12 inches. Effective rooting depth is 40 to 60 inches or more. Runoff is rapid, and the hazard of water erosion is high.

This unit is used as rangeland and for wildlife habitat.

The potential plant community on this unit is mainly bluebunch wheatgrass, oniongrass, antelope bitterbrush, and big sagebrush. The suitability of the unit for rangeland seeding is poor. The main limitations are slope and low available water capacity.

Management practices suitable for use on this unit are proper grazing use and planned grazing systems. Shrubs can be controlled by chemical treatment.

This map unit is in capability unit VIe-M4, nonirrigated, and in Mountain Stony Loam range site.

DBF—Dagan very stony loam, 40 to 70 percent slopes. This deep, well drained soil is on foothills and fault escarpments immediately east of Bear Lake. It formed in colluvium derived dominantly from sandstone. Slopes are long and are convex or concave. They dominantly face west and south. The present vegetation is mainly big sagebrush, low sagebrush, bluebunch wheatgrass, and needleandthread. Elevation is 6,000 to 7,000 feet. The average annual precipitation is about 12 to 14 inches, the mean annual air temperature is 40 to 44 degrees F, and the average freeze-free season is 75 to 90 days.

Typically, the surface layer is very dark brown very stony loam about 12 inches thick. The subsoil is dark brown and dark red very gravelly loam about 17 inches thick. The substratum is red and yellowish red extremely gravelly loam 21 inches thick. Fractured sandstone is at a depth of 50 inches. A layer of secondary calcium carbonate is at a depth of about 29 inches. Depth to bedrock ranges from 40 to 60 inches or more.

Included in this unit are about 10 percent moderately deep, well drained soils that are extremely gravelly and cobbly and are intermingled throughout the unit and 5 percent Rock outcrop on very steep escarpments and ridges.

Permeability of this Dagan soil is moderate. Available water capacity is about 4 to 5 inches. Water supplying capacity is 7 to 9 inches. Effective rooting depth is 40 to 60 inches or more. Runoff is rapid, and the hazard of water erosion is high.

This unit is used as rangeland and for wildlife habitat.

The potential plant community on this unit is mainly bluebunch wheatgrass, black sagebrush, muttongrass, and antelope bitterbrush. The suitability of the unit for rangeland seeding is very poor. The main limitations are slope and rock fragments in the surface layer. Shrubs on this unit provide good food and cover for deer in winter.

Management practices that maintain or improve the range vegetation include proper grazing use, planned grazing systems, fencing, and stock water developments.

This map unit is in capability unit VIIe-U4, nonirrigated, and in Upland Stony Loam range site.

DCF—Dagan gravelly silt loam, 25 to 40 percent slopes. This deep and very deep, well drained soil is on foothills and stream-cut canyon walls in an area east of Bear Lake. It formed in colluvium derived dominantly from conglomerate composed of quartzite and

sandstone. Slopes are long and convex. They dominantly face south and west. The present vegetation is mainly big sagebrush, bluebunch wheatgrass, and muttongrass. Elevation is 6,500 to 6,800 feet. The average annual precipitation is about 12 to 16 inches, the mean annual air temperature is 40 to 42 degrees F and the average freeze-free season is 70 to 90 days.

Typically, the surface layer is dark brown gravelly silt loam about 15 inches thick. The subsoil is reddish brown extremely gravelly silt loam about 13 inches thick. The substratum to a depth of 60 inches or more is dark brown and reddish brown extremely gravelly silt loam. A layer of secondary calcium carbonate accumulation is at a depth of about 28 inches.

Included in this unit is about 5 percent Dennot very gravelly loam, 4 to 15 percent slopes, on toe slopes.

Permeability of this Dagan soil is moderate. Available water capacity is about 5 to 6 inches. Water supplying capacity is 7 to 9 inches. Effective rooting depth is 60 inches or more. Runoff is rapid, and the hazard of water erosion is high.

This unit is used as rangeland and for wildlife habitat.

The potential plant community on this unit is mainly bluebunch wheatgrass, black sagebrush, muttongrass, and antelope bitterbrush. The suitability of the unit for rangeland seeding is poor. The main limitations are slope and low available water capacity.

Management practices that maintain or improve the range vegetation include proper grazing use, planned grazing systems, fencing, and stock water developments. Shrubs can be controlled by chemical treatment.

This map unit is in capability unit VIe-U4, nonirrigated, and in Upland Stony Loam range site.

DDF—Dagan-Rubble Land complex, 40 to 70 percent slopes. This map unit is on fault escarpments and stream-cut canyon walls east of Bear Lake and on southwest-facing slopes in Meachum Canyon. Slopes are long, convex or concave, and south- and west-facing. The present vegetation is mainly big sagebrush, bluebunch wheatgrass, bitterbrush, balsamroot, and mountainmahogany. Elevation is 6,000 to 7,700 feet. The average annual precipitation is about 12 to 15 inches, the mean annual air temperature is 37 to 42 degrees F, and the average freeze-free season is 55 to 80 days.

This unit is 55 percent Dagan very stony loam and 30 percent Rubble Land. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are about 10 percent Solak gravelly loam, 10 to 50 percent slopes, below areas of Rock outcrop and 5 percent Rock outcrop on ridges and ledges of steep valley sides.

The Dagan soil is deep and well drained. It formed in residuum and colluvium derived dominantly from sandstone. Typically, the surface layer is very dark brown very stony loam about 10 inches thick. The subsoil is dark brown very gravelly loam and brown very cobbly loam about 18 inches thick. The substratum is light brown extremely cobbly sandy loam 13 inches thick. Fractured sandstone is at a depth of about 41 inches. A layer of secondary calcium carbonate accumulation is at a depth of about 28 inches. Depth to bedrock is 40 to 60 inches or more.

Permeability of the Dagan soil is moderate. Available water capacity is about 3.5 to 5.0 inches. Water supplying capacity is 7 to 9 inches. Effective rooting depth is 40 to 60 inches or more. Runoff is rapid, and the hazard of water erosion is high.

Rubble Land consists of areas of angular sandstone rock fragments that are 3 to 48 inches in diameter. These rock fragments have been parted from areas of Rock outcrop mainly by frost action and then moved downslope. Voids are free of soil material. Areas of Rubble Land are mainly barren of vegetation.

This unit is used mainly as rangeland and for wildlife habitat.

The potential plant community on the Dagan soil is mainly bluebunch wheatgrass, black sagebrush, muttongrass, and antelope bitterbrush. The suitability of the soil for rangeland seeding is very poor. The main limitations are slope and rock fragments in the surface layer. Shrubs on this unit provide good food and cover for deer in winter.

Management practices that maintain or improve the range vegetation include proper grazing use, planned grazing systems, fencing, and stock water developments.

This map unit is in capability unit VIIe-U4, nonirrigated, and in Upland Stony Loam range site.

DEE—Dennot loam, 25 to 40 percent slopes. This deep, well drained soil is on foothills in the south-central part of Rich County. It formed in residuum and colluvium derived dominantly from conglomerate composed of sandstone, limestone, and quartzite. Slopes are medium to long and are convex or concave. They face north. The present vegetation is mainly big sagebrush, Utah serviceberry, mountain snowberry, and Sandberg bluegrass. Elevation is 6,900 to 7,800 feet. The average annual precipitation is about 13 to 16 inches, the mean annual air temperature is 35 to 38 degrees F, and the average freeze-free season is 60 to 75 days.

Typically, the surface layer is dark reddish brown loam about 15 inches thick. The subsoil is dark red very gravelly loam about 5 inches thick. The substratum is red very gravelly loam 30 inches thick. Fractured sandstone is at a depth of 50 inches. Depth to sandstone ranges from 40 to 60 inches.

Included in this unit are about 5 percent Cutoff gravelly loam, 25 to 60 percent slopes, intermingled throughout the unit; 5 percent Dagan gravelly silt loam, 25 to 40 percent slopes, on north- and east-facing side slopes; 3 percent Slinger gravelly loam, 25 to 40 percent slopes, in

convex areas on ridges; and 2 percent Kearl loam, 25 to 40 percent slopes, at the higher elevations in the unit.

Permeability of this Dennot soil is moderate. Available water capacity is about 5.0 to 6.5 inches. Water supplying capacity is 7 to 10 inches. Effective rooting depth is 40 to 60 inches or more. Runoff is rapid, and the hazard of water erosion is moderate.

This unit is used as rangeland and for wildlife habitat.

The potential plant community on this unit is mainly bluebunch wheatgrass, black sagebrush, muttongrass, and antelope bitterbrush. The suitability of the unit for rangeland seeding is poor. The main limitations are slope, rock fragments in the surface layer, and low available water capacity.

Management practices that maintain or improve the range vegetation include proper grazing use, planned grazing systems, fencing, and stock water development. Areas where there are excessive shrubs can be improved by chemical treatment.

This map unit is in capability unit VIe-U4, nonirrigated, and in Upland Stony Loam range site.

DFC—Dennot very gravelly loam, 4 to 15 percent slopes. This very deep, well drained soil is on alluvial fans and toe slopes in the north-central part of Rich County. It formed in alluvium and colluvium derived dominantly from conglomerate composed of sandstone, quartzite, and limestone. Slopes are long and convex or concave. The present vegetation is mainly big sagebrush, bluebunch wheatgrass, Indian ricegrass, and lanceleaf yellowbrush. Elevation is 5,950 to 7,000 feet. The average annual precipitation is about 12 to 15 inches, the mean annual air temperature is 38 to 43 degrees F, and the average freeze-free season is 75 to 90 days.

Typically, the surface layer is dark reddish brown very gravelly loam 7 inches thick. The subsoil is reddish brown very gravelly loam 4 inches thick. The upper 17 inches of the substratum is yellowish red extremely gravelly loam, and the lower part to a depth of 60 inches or more is dark red extremely gravelly sandy loam and red extremely cobbly fine sandy loam.

Included in this unit are about 7 percent very deep, well drained soils that are very gravelly and have a layer of clay accumulation; 3 percent Thatcher silt loam, warm, 6 to 10 percent slopes; and 2 percent Thatcher silt loam, 5 to 10 percent slopes. All of these soils are intermingled throughout the unit. Also included is 3 percent Ellett silt loam, 2 to 10 percent slopes, on narrow ridges.

Permeability of this Dennot soil is moderate. Available water capacity is about 3.5 to 6.0 inches. Water supplying capacity is 6 to 8 inches. Effective rooting depth is 60 inches or more. Runoff is rapid, and the hazard of water erosion is moderate.

Most areas of this unit are used as rangeland and for wildlife habitat. A few areas are used as homesites.

The potential plant community on this unit is mainly bluebunch wheatgrass, black sagebrush, muttongrass, and antelope bitterbrush. The suitability of the unit for rangeland seeding is fair. The main limitations are the rock fragments in the surface layer and low available water capacity.

Management practices that maintain or improve the range vegetation include proper grazing use, planned grazing systems, fencing, and stock water development. Shrubs can be controlled by chemical treatment or prescribed burning.

This unit is well suited to homesite development. The main limitation is steepness of slope in areas where slopes are more than 8 percent. In summer, irrigation is needed for lawn grasses, shrubs, vines, shade trees, and ornamental trees.

This map unit is in capability unit VIe-U4, nonirrigated, and in Upland Stony Loam range site.

DGF—Despain gravelly loam, 30 to 60 percent slopes. This very deep, well drained soil is on mountainsides and foothills, mainly in the northwestern part of Rich County. It formed in colluvium derived dominantly from conglomerate composed of sandstone, limestone, and quartzite. Slopes are long and convex or concave. They dominantly face north. The present vegetation is mainly big sagebrush, antelope bitterbrush, Utah serviceberry, and bluebunch wheatgrass. Elevation is 6,000 to 7,200 feet. The average annual precipitation is about 16 to 30 inches, the mean annual air temperature is 37 to 42 degrees F, and the average freeze-free season is 60 to 85 days.

Typically, the surface layer is dark brown gravelly loam about 16 inches thick. The subsoil is dark brown gravelly loam about 24 inches thick. The substratum to a depth of 60 inches or more is yellowish red very gravelly loam.

Included in this unit are about 10 percent deep loam that has a thick, dark-colored surface layer and 5 percent Hades silt loam, 3 to 6 percent slopes. These soils are intermingled throughout the unit.

Permeability of this Despain soil is moderate. Available water capacity is about 6.0 to 7.5 inches. Water supplying capacity is 10 to 17 inches. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used as rangeland and for wildlife habitat.

The potential plant community on this unit is mainly bluebunch wheatgrass, bearded wheatgrass, and basin wildrye. The suitability of the unit for rangeland seeding is very poor. The main limitation is slope.

Management practices that maintain or improve the range vegetation include proper grazing use, planned grazing systems, fencing, and stock water developments.

This map unit is in capability unit VIIe-M, nonirrigated, and in Mountain Loam range site.

DHB—Despain Variant gravelly loam, 1 to 3 percent slopes. This very deep, well drained soil is on alluvial fans along the west side of Bear Lake. It formed in alluvium derived dominantly from limestone, sandstone, and quartzite. Slopes are long and convex or concave. They face east. The present vegetation in areas not cultivated is mainly big sagebrush, bluebunch wheatgrass, lanceleaf yellowbrush, and muttongrass. Elevation is 5,900 to 6,200 feet. The average annual precipitation is about 12 to 16 inches, the mean annual air temperature is 40 to 44 degrees F, and the average freeze-free season is 80 to 90 days.

Typically, the surface layer is very dark brown gravelly loam 18 inches thick. The upper 19 inches of the underlying material is very dark grayish brown very gravelly loam, and the lower part to a depth of 60 inches or more is dark brown extremely gravelly loam and extremely gravelly sandy loam.

Included in this unit are about 10 percent very deep soils that are sandy and gravelly and have a thick, dark-colored surface layer and 5 percent Thatcher silt loam, warm, 1 to 3 percent slopes. These soils are intermingled throughout the unit.

Permeability of this Despain Variant soil is moderate. Available water capacity is about 5.0 to 6.5 inches. Water supplying capacity is 7 to 9 inches. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight.

This unit is used for irrigated crops, as homesites, and for urban development.

This unit is well suited to irrigated alfalfa, small grain, and raspberries. Maintaining crop residue on or near the surface reduces runoff, reduces erosion, and helps to maintain soil tilth and organic matter content. Tillage should be kept to a minimum. If this unit is irrigated, it produces about 4 tons of alfalfa per acre, 75 bushels of barley or wheat per acre, 2.5 tons of raspberries per acre, or 8 animal-unit-months of forage per acre.

Population growth has resulted in increased construction of homes on this unit. The unit has few limitations for use as homesites. In summer, irrigation is needed for lawn grasses, shrubs, vines, shade trees, and ornamental trees.

This map unit is in capability unit IIIs-3, irrigated.

DJA—Duckree loam, 0 to 3 percent slopes. This very deep, well drained soil is on flood plains, stream terraces, and valley bottoms of major streams. It formed in alluvium derived from mixed parent material. Slopes are long and are gently undulating. The present vegetation is mainly big sagebrush, lanceleaf yellowbrush, Nevada bluegrass, and Sandberg bluegrass. Elevation is 6,200 to 6,400 feet. The average annual precipitation is about 9 to 11 inches, the mean annual air temperature is 38 to 42 degrees F, and the average freeze-free season is 55 to 65 days.

Typically, the surface layer is brown loam 3 inches thick. The upper 11 inches of the underlying material is brown loam, the next 18 inches is reddish yellow very gravelly loam, and the lower part to a depth of 60 inches or more is yellowish red extremely gravelly loamy sand.

Included in this unit are about 9 percent Cowco loam, 0 to 3 percent slopes, intermingled throughout the unit; 3 percent Bockston loam, cool, 0 to 3 percent slopes, intermingled throughout the unit; 2 percent Saleratus loam in old stream channels; and 1 percent Duckree gravelly loam, 3 to 25 percent slopes, on toe slopes of foothills.

Permeability of this Duckree soil is moderately rapid. Available water capacity is about 4 to 5 inches. Water supplying capacity is 6 to 7 inches. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The soil is subject to rare periods of flooding.

This unit is used mainly for irrigated crops. It is also used as homesites and rangeland and for wildlife habitat.

This unit is well suited to irrigated small grain and alfalfa. It is limited mainly by the droughtiness of the subsoil. Because of this limitation, applications of irrigation water should be light and frequent. Tilth and fertility can be improved by returning crop residue to the soil. Tillage should be kept to a minimum. If this unit is irrigated, it produces about 2.5 tons of alfalfa per acre, 60 bushels of barley per acre, or 5.5 animal-unit-months of forage per acre.

This unit is well suited to homesite development. The main limitation is the hazard of flooding in unprotected areas. In summer, irrigation is needed for lawn grasses, shrubs, vines, shade trees, and ornamental trees.

The potential plant community on this unit is mainly bluebunch wheatgrass, needleandthread, bottlebrush squirreltail, and big sagebrush. The suitability of the unit for rangeland seeding is fair. The main limitation is low precipitation.

Management practices that maintain or improve the range vegetation include proper grazing use, planned grazing systems, fencing, and stock water development. Shrubs can be controlled by chemical treatment, mechanical treatment, or prescribed burning.

This map unit is in capability unit IVs-4, irrigated, and VIs-S4, nonirrigated. It is in Semidesert Loam range site.

DKD—Duckree gravelly loam, 3 to 25 percent slopes. This very deep, somewhat excessively drained soil is on alluvial fans and terraces along drainageways north of Sixmile Creek and at the foot of the Crawford Mountains. It formed in alluvium derived dominantly from sandstone, limestone, quartzite, and chert. Slopes are medium to long and are slightly concave or convex. They dominantly face south and west. The present vegetation is mainly big sagebrush, Sandberg bluegrass, phlox, and lanceleaf yellowbrush. Elevation is 6,500 to 6,800 feet. The average annual precipitation is about 9 to 12 inches,

the mean annual air temperature is 38 to 44 degrees F, and the average freeze-free season is 55 to 65 days.

Typically, the surface layer is brown gravelly loam 2 inches thick. The upper 40 inches of the underlying material is brown and strong brown very gravelly loam, and the lower part to a depth of 60 inches or more is brown extremely gravelly fine sandy loam.

Included in this unit are about 4 percent Bequinn very gravelly loam, 30 to 50 percent slopes, on the upper part of alluvial fans; 3 percent Dagan gravelly silt loam, 25 to 40 percent slopes, on short north-facing side slopes; and 3 percent Duckree gravelly silt loam, 15 to 40 percent slopes, intermingled throughout the unit.

Permeability of this Duckree soil is moderately rapid. Available water capacity is about 3.5 to 5.0 inches. Water supplying capacity is 5 to 7 inches. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used as rangeland and for wildlife habitat.

The potential plant community on this unit is mainly Indian ricegrass, bluebunch wheatgrass, shadscale, and black sagebrush. The suitability of the unit for rangeland seeding is fair. The main limitations are slope and low available water capacity.

Management practices that maintain or improve the range vegetation include proper grazing use, planned grazing systems, fencing, and stock water development. Areas where there are excessive shrubs can be improved by chemical treatment, mechanical treatment, or prescribed burning.

This map unit is in capability unit VIIe-S4, nonirrigated, and in Semidesert Stony Loam range site.

DLE—Duckree gravelly silt loam, 15 to 40 percent slopes. This very deep, somewhat excessively drained soil is on stream-cut valley sides and foothills in the western part of Rich County. It formed in colluvium derived dominantly from a conglomerate composed of sandstone and quartzite. Slopes are medium to long and are slightly convex to slightly concave. They face east, south, and west. The present vegetation is mainly black sagebrush, Sandberg bluegrass, Nevada bluegrass, and Hood phlox. Elevation is 6,300 to 7,150 feet. The average annual precipitation is about 10 to 13 inches, the mean annual air temperature is 38 to 40 degrees F, and the average freeze-free season is 60 to 75 days.

Typically, the surface layer is yellowish brown gravelly silt loam 6 inches thick. The subsoil is light brown very gravelly loam 9 inches thick. The upper 13 inches of the substratum is light brown very gravelly loam, and the lower part to a depth of 60 inches or more is extremely gravelly loamy sand. A layer of carbonate accumulation is at a depth of about 15 inches.

Included in this unit are about 6 percent Cutoff gravelly loam, 25 to 60 percent slopes, intermingled throughout the unit; 6 percent Dagan gravelly silt loam, 25 to 40 percent slopes, on north- and east-facing side slopes; 3 percent Solak gravelly loam, 10 to 50 percent slopes, on ridgetops; and 2 percent Pancheri silt loam, cool, 10 to 20 percent slopes, eroded, that is in small, convex areas at the lower elevations. Also included are small areas of Rock outcrop. Included areas make up about 20 percent of the total acreage.

Permeability of this Duckree soil is moderately rapid. Available water capacity is about 4 to 5 inches. Water supplying capacity is 5 to 6 inches. Effective rooting depth is 60 inches or more. Runoff is rapid, and the hazard of water erosion is high.

This unit is used mainly as rangeland and for wildlife habitat. It is also used as homesites.

The potential plant community on this unit is mainly Indian ricegrass, bluebunch wheatgrass, shadscale, and black sagebrush. The suitability of the unit for rangeland seeding is poor. The main limitations are slope and low available water capacity.

Management practices that maintain or improve the range vegetation include proper grazing use, planned grazing systems, fencing, and stock water development. Shrubs can be controlled by chemical treatment.

Population growth has resulted in increased construction of homes on this unit. The main limitation for use as homesites is slope. Slope is also a concern in installing septic tank absorption fields. Absorption lines should be installed on the contour.

This map unit is in capability unit VIIe-S4, nonirrigated, and in Semidesert Stony Loam range site.

DMF—Duckree-St. Marys, dry association, 25 to 50 percent slopes. This map unit is on foothills and mountainsides near Woodruff Reservoir. Elevation is 6,750 to 7,900 feet. The average annual precipitation is about 11 to 18 inches, the mean annual air temperature is 35 to 39 degrees F, and the average freeze-free season is 60 to 75 days.

This unit is 50 percent Duckree very gravelly loam and 40 percent St. Marys gravelly loam that receives low rainfall. The Duckree soil is on south- and west-facing side slopes, and the St. Marys soil is dominantly on east-facing side slopes. Aspect greatly influences the amount of effective precipitation the soils receive.

Included in this unit are about 3 percent Cutoff gravelly loam, 25 to 60 percent slopes, on south- and west-facing side slopes; 3 percent Dagan gravelly loam, moist, 25 to 40 percent slopes, dominantly on east-facing side slopes; 2 percent Dennot loam, 25 to 40 percent slopes, dominantly on east-facing side slopes; and 2 percent Solak gravelly loam, 10 to 50 percent slopes, on ridges.

The Duckree soil is very deep and somewhat excessively drained. It formed in colluvium derived dominantly from conglomerate and sandstone. Slopes are long and slightly convex. The present vegetation is mainly black sagebrush, Indian ricegrass, Sandberg bluegrass, and Hood phlox.

Typically, the surface layer of the Duckree soil is dark brown very gravelly loam 5 inches thick. The subsoil is yellowish brown very gravelly sandy loam 11 inches thick. The substratum to a depth of 60 inches or more is very pale brown extremely gravelly sandy loam.

Permeability of the Duckree soil is moderately rapid. Available water capacity is about 3.5 to 4.5 inches. Water supplying capacity is 5 to 8 inches. Effective rooting depth is 60 inches or more. Runoff is rapid, and the hazard of water erosion is high.

The St. Marys soil is deep and well drained. It formed in residuum and colluvium derived dominantly from conglomerate and sandstone. Slopes are long and are convex or concave. The present vegetation is mainly big sagebrush, lanceleaf yellowbrush, bluebunch wheatgrass, and mountain snowberry.

Typically, the surface layer of the St. Marys soil is dark brown gravelly loam 17 inches thick. The subsoil is dark reddish brown very gravelly loam 8 inches thick. The substratum is reddish brown extremely gravelly fine sandy loam 25 inches thick. Sandstone is at a depth of 50 inches. Depth to sandstone ranges from 40 to 60 inches.

Permeability of the St. Marys soil is moderate. Available water capacity is about 4 to 5 inches. Water supplying capacity is 6 to 10 inches. Effective rooting depth is 40 to 60 inches. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used as rangeland.

The potential plant community on the Duckree soil is mainly bluebunch wheatgrass, Indian ricegrass, shadscale, and black sagebrush. The potential plant community on the St. Marys soil is mainly bluebunch wheatgrass, black sagebrush, muttongrass, and bitterbrush. The suitability of this unit for rangeland seeding is poor. The main limitations are slope and low available water capacity.

Management practices that maintain or improve the range vegetation include proper grazing use, planned grazing systems, fencing, and stock water development. Shrubs can be controlled by chemical treatment.

This map unit is in capability unit VIIe-S4, nonirrigated. The Duckree soil is in Semidesert Stony Loam range site, and the St. Marys soil is in Upland Stony Loam range site.

EAC—Ellett silt loam, 2 to 10 percent slopes. This shallow, well drained soil is on foothills, mainly in North Eden Canyon. It formed in colluvium and residuum derived dominantly from shale. Slopes are long and convex. The present vegetation is mainly low sagebrush, Indian ricegrass, Hood phlox, and bluebunch wheatgrass. Elevation is 6,200 to 7,100 feet. The average annual precipitation is about 12 to 16 inches, the mean annual air temperature is 38 to 41 degrees F, and the average freeze-free season is 65 to 80 days.

Typically, the surface layer is grayish brown silt loam about 3 inches thick. The underlying material is light brownish gray and grayish brown silt loam 11 inches thick. Soft shale is at a depth of 14 inches. Depth to shale ranges from 10 to 20 inches.

Included in this unit are about 5 percent Thatcher silt loam, 5 to 10 percent slopes, and 5 percent Gobine silt loam, 1 to 10 percent slopes, on north- and east-facing side slopes.

Permeability of this Ellett soil is moderately slow. Available water capacity is about 1 inch to 3 inches. Water supplying capacity is 2 to 5 inches. Effective rooting depth is 7 to 20 inches. Runoff is medium, and the hazard of water erosion is high.

This unit is used as rangeland and for wildlife habitat.

The potential plant community on this unit is mainly low sagebrush, rubber rabbitbrush, bottlebrush squirreltail, and bluebunch wheatgrass. The suitability of the unit for rangeland seeding is very poor. The main limitations are low available water capacity and depth to shale.

Management practices that maintain or improve the range vegetation include proper grazing use, planned grazing systems, fencing, and stock water developments. If the plant cover is disturbed, protection is needed to control gullying and sheet erosion.

This map unit is in capability unit VIIs-U3, nonirrigated, and in Upland Loamy Shale range site.

EAE—Ellett silt loam, 10 to 30 percent slopes. This shallow and very shallow, well drained soil is on foothills, mainly in North Eden Canyon and in Walton Canyon. It formed in colluvium and residuum derived dominantly from shale. Slopes are medium to long and are convex. The present vegetation is mainly bluebunch wheatgrass, Indian ricegrass, low sagebrush, and Nevada bluegrass. Elevation is 6,200 to 7,200 feet. The average annual precipitation is about 12 to 16 inches, the mean annual air temperature is 38 to 41 degrees F, and the average freeze-free season is 65 to 80 days.

Typically, the surface layer is brown silt loam about 4 inches thick. The underlying material is brown silt loam about 10 inches thick. Soft shale is at a depth of 14 inches. Depth to shale ranges from 7 to 20 inches.

Included in this unit are about 10 percent deep, loamy soils that have a dark-colored surface layer; 5 percent Thatcher silt loam, 10 to 20 percent slopes, on north- and east-facing side slopes; 3 percent Ellett silt loam, 2 to 10 percent slopes; and 2 percent Slinger gravelly loam, 25 to 40 percent slopes.

Permeability of this Ellett soil is moderately slow. Available water capacity is about 1 inch to 3 inches. Water supplying capacity is 2 to 5 inches. Effective rooting depth is 7 to 20 inches. Runoff is rapid, and the hazard of water erosion is high.

This unit is used as rangeland and for wildlife habitat.

The potential plant community on this unit is mainly low sagebrush, rubber rabbitbrush, bottlebrush squirreltail, and bluebunch wheatgrass. The suitability of the unit for rangeland seeding is very poor. The main limitations are low available water capacity and depth to shale.

Management practices that maintain or improve the range vegetation include proper grazing use, planned grazing systems, fencing, and stock water developments. If the plant cover is disturbed, practices are needed to control gullying and sheet erosion.

This map unit is in capability unit VIIs-U3, nonirrigated, and in Upland Loamy Shale range site.

EBD—Ercan loam, 3 to 15 percent slopes. This deep, well drained soil is on mountainsides in the southwestern part of Rich County, near the boundary between Rich and Morgan Counties. It formed in residuum and some colluvium derived dominantly from sandstone. Slopes are long and are slightly concave to slightly convex. They dominantly face north. The present vegetation is mainly quaking aspen and an understory of mountain brome, nodding bluegrass, and blue wildrye. Elevation is 7,400 to 8,700 feet. The average annual precipitation is about 20 to 32 inches, the mean annual air temperature is 32 to 37 degrees F, and the average freeze-free season is 30 to 75 days.

Typically, the surface layer is very dark grayish brown loam about 16 inches thick. The subsurface layer is strong brown loam about 12 inches thick. The subsoil is yellowish red gravelly clay loam about 29 inches thick. Fractured sandstone is at a depth of about 57 inches. Depth to sandstone ranges from 40 to 60 inches.

Included in this unit are about 10 percent Yeljack loam, 6 to 25 percent slopes, under shrubs and grasses; 4 percent Lucky Star gravelly loam, 8 to 25 percent slopes; 3 percent Ercan loam, 15 to 30 percent slopes, in the steeper areas; and 3 percent Condie gravelly loam, 6 to 25 percent slopes, under conifers.

Permeability of this Ercan soil is moderately slow. Available water capacity is about 8 to 9 inches. Water supplying capacity is 13 to 21 inches. Effective rooting depth is 40 to 60 inches. Runoff is medium, and the hazard of water erosion is moderate.

This unit is woodland, but it is used primarily as rangeland and for wildlife habitat.

This unit is well suited to the production of aspen. The site index for aspen is 64. The soil in the unit can produce about 3,300 cubic feet, or 2,200 board feet (International rule), of merchantable timber per acre from an even-aged, fully stocked stand of trees 100 years old.

The potential understory plant community on this unit is mountain brome, dryland sedges, blue wildrye, and edible valorian.

Management practices suitable for use on this unit are proper grazing use and planned grazing systems.

This map unit is in capability unit VIe-HA, nonirrigated, and in woodland suitability group 3o2.

EBE—Ercan loam, 15 to 30 percent slopes. This deep, well drained soil is on mountainsides in the southwestern part of Rich County, near the boundary between Rich and Morgan Counties. It formed in residuum and colluvium derived dominantly from sandstone. Slopes are long and are concave or convex. They face east and north. The present vegetation is mainly quaking aspen and an understory of bearded wheatgrass, Fendler meadowrue, and mountain snowberry. Elevation is 7,200 to 8,700 feet. The average annual precipitation is about 20 to 34 inches, the mean annual air temperature is 32 to 38 degrees F, and the average freeze-free season is 30 to 75 days.

Typically, the surface layer is very dark grayish brown loam about 19 inches thick. The subsurface layer is brown sandy loam about 21 inches thick. The subsoil is yellowish red sandy clay loam 20 inches thick. Fractured, weathered sandstone is at a depth of 60 inches. Depth to sandstone ranges from 40 to 60 inches.

Included in this unit are about 7 percent Yeljack loam, 6 to 25 percent slopes, under shrubs and grasses; 6 percent Ercan loam, 3 to 15 percent slopes, in the less steeply sloping areas; 5 percent Condie gravelly loam, 6 to 25 percent slopes, under conifers; 4 percent Lucky Star gravelly loam, 8 to 25 percent slopes; and 3 percent Etchen very cobbly loam, 25 to 40 percent slopes, that is on south- and west-facing side slopes and is under shrubs and grasses.

Permeability of this Ercan soil is moderately slow. Available water capacity is about 9.0 to 10.5 inches. Water supplying capacity is 14 to 24 inches. Effective rooting depth is 40 to 60 inches. Runoff is medium, and the hazard of water erosion is moderate.

This unit is woodland, but it is used primarily for livestock grazing and wildlife habitat.

This unit is well suited to the production of aspen. The site index for aspen is 64. The soil in the unit can produce about 3,300 cubic feet, or 2,200 board feet (International rule), of merchantable timber per acre from an even-aged, fully stocked stand of trees 100 years old.

The potential understory plant community is mainly mountain brome, dryland sedges, blue wildrye, and edible valerian.

Management practices suitable for use on this unit are proper grazing use and planned grazing systems.

This map unit is in capability unit VIe-HA, nonirrigated, and in woodland suitability group 3o2.

ECE—Etchen very cobbly loam, 25 to 40 percent slopes. This moderately deep, well drained soil is on uplands and mountainsides in the southwestern part of Rich County. It formed in residuum and colluvium derived dominantly from sandstone and conglomerate. Slopes are medium to long and are convex. They face south

and west. The present vegetation is mainly western wheatgrass, big sagebrush, antelope bitterbrush, and lanceleaf yellowbrush. Elevation is 6,750 to 8,100 feet. The average annual precipitation is about 18 to 25 inches, the mean annual air temperature is 36 to 39 degrees F, and the average freeze-free season is 70 to 90 days.

Typically, the surface layer is dark reddish brown very cobbly loam about 4 inches thick. The subsoil is reddish brown and yellowish red very gravelly clay loam about 17 inches thick. The substratum is red extremely gravelly sandy clay loam about 8 inches thick. Sandstone is at a depth of 29 inches. Depth to sandstone ranges from 20 to 40 inches.

Included in this unit are about 6 percent Slinger gravelly loam, 25 to 40 percent slopes, commonly at the lower elevations; 4 percent Cutoff gravelly loam, 25 to 60 percent slopes, intermingled throughout the unit; 3 percent Bullnel loam, 15 to 30 percent slopes, in the less steeply sloping areas; and 2 percent Solak gravelly loam, 10 to 50 percent slopes, on ridges.

Permeability of this Etchen soil is moderately slow. Available water capacity is about 2.5 to 3.5 inches. Water supplying capacity is 6 to 10 inches. Effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high.

This unit is used as rangeland and for wildlife habitat.

The potential plant community on this unit is mainly bluebunch wheatgrass, oniongrass, antelope bitterbrush, and big sagebrush. The suitability of the unit for rangeland seeding is poor. The main limitations are low available water capacity, depth to bedrock, rock fragments in the surface layer, and slope.

Management practices suitable for use on this unit are proper grazing use and planned grazing systems. Shrubs can be controlled by chemical treatment.

This map unit is in capability unit VIs-MX, nonirrigated, and in Mountain Stony Loam range site.

FAE—Falula very gravelly loam, 4 to 25 percent slopes. This shallow, somewhat excessively drained soil is on foothills east of Bear Lake. It formed in colluvium and residuum derived dominantly from sandstone and conglomerate. Slopes are long and convex. The present vegetation is mainly big sagebrush, low sagebrush, bluebunch wheatgrass, and lanceleaf yellowbrush. Elevation is 6,000 to 7,000 feet. The average annual precipitation is about 12 to 16 inches, the mean annual air temperature is 38 to 42 degrees F, and the average freeze-free season is 65 to 85 days.

Typically, the surface layer is dark brown very gravelly loam about 10 inches thick. The underlying material is brown very gravelly loam about 7 inches thick. Fractured conglomerate is at a depth of about 17 inches. Depth to conglomerate ranges from 10 to 20 inches.

Included in this unit are about 5 percent Kearl loam, 15 to 25 percent slopes, on north- and east-facing side slopes; 4 percent Solak gravelly loam, 10 to 50 percent slopes, on ridgetops; 4 percent soils that are similar to this Falula soil but are noncalcareous and are in slightly concave areas; 4 percent soils that are similar to this Falula soil but are very steep and are on short stream-cut side slopes; and 3 percent areas of Rock outcrop on ridges.

Permeability of this Falula soil is moderate. Available water capacity is about 1 inch to 2 inches. Water supplying capacity is 2 to 5 inches. Effective rooting depth is 10 to 20 inches. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used as rangeland and for wildlife habitat.

The potential plant community on this unit is mainly bluebunch wheatgrass, big sagebrush, black sagebrush, and Sandberg bluegrass. Loss of the surface layer results in a severe decrease in productivity and in the potential of the soil in the unit to produce plants suitable for grazing. The suitability of the unit for rangeland seeding is very poor. The main limitations are depth to bedrock and low available water capacity.

Management practices that maintain or improve the range vegetation include proper grazing use, planned grazing systems, fencing, and stock water developments. Shrubs can be controlled by chemical treatment, mechanical treatment, or prescribed burning.

This map unit is in capability unit VIIs-U3, nonirrigated, and in Upland Shallow Loam range site.

FBC—Falula gravelly silt loam, 1 to 10 percent slopes. This shallow, somewhat excessively drained soil is on plateaus east of Bear Lake. It formed in residuum derived dominantly from conglomerate and sandstone. Slopes are long and are convex and concave. The present vegetation is mainly big sagebrush, lanceleaf yellowbrush, bluebunch wheatgrass, Hood phlox, and Sandberg bluegrass. Elevation is 6,500 to 7,000 feet. The average annual precipitation is about 12 to 14 inches, the mean annual air temperature is 38 to 42 degrees F, and the average freeze-free season is 65 to 75 days.

Typically, the surface layer is dark reddish brown gravelly silt loam 7 inches thick. The underlying material is dark reddish brown very gravelly silt loam about 9 inches thick. Conglomerate is at a depth of 16 inches. Depth to conglomerate ranges from 10 to 20 inches.

Included in this unit are about 5 percent Falula very gravelly loam, 4 to 25 percent slopes; 3 percent Kearl loam, 4 to 15 percent slopes; and 2 percent Thatcher silt loam, 1 to 5 percent slopes. These soils are intermingled throughout the unit.

Permeability of this Falula soil is moderate. Available water capacity is about 1 inch to 2 inches. Water supplying capacity is 1.5 to 4.0 inches. Effective rooting depth is 10 to 20 inches. Runoff is medium, and the hazard of water erosion is slight.

Most areas of this unit are used as rangeland. A few areas are used for nonirrigated crops.

The potential plant community on this unit is mainly bluebunch wheatgrass, big sagebrush, black sagebrush, and Sandberg bluegrass. The suitability of the unit for rangeland seeding is very poor. The main limitations are depth to bedrock and low available water capacity.

Management practices that maintain or improve the range vegetation include proper grazing use, planned grazing systems, fencing, and stock water developments. Shrubs can be controlled by chemical treatment, mechanical treatment, or prescribed burning.

This unit is poorly suited to nonirrigated crops. It is limited mainly by low available water capacity and shallow rooting depth.

This map unit is in capability unit VIIs-U3, nonirrigated, and in Upland Shallow Loam range site.

FCE—Falula-Kearl complex, 4 to 25 percent slopes. This map unit is on foothills west of the Bear River and Saleratus Creek flood plains. Elevation is 6,400 to 7,300 feet. The average annual precipitation is about 12 to 14 inches, the mean annual air temperature is 37 to 39 degrees F, and the average freeze-free season is 60 to 75 days.

This unit is about 45 percent Falula gravelly loam, 4 to 25 percent slopes, and 40 percent Kearl silt loam, 4 to 15 percent slopes. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are about 5 percent Kearl loam, 4 to 15 percent slopes, intermingled throughout the unit; 4 percent Gobine silt loam, 1 to 10 percent slopes, intermingled throughout the unit; 2 percent Thatcher silt loam, 5 to 10 percent slopes, in small concave areas; and 2 percent Rock outcrop on ridgetops. Also included are small areas of Despain gravelly loam, 30 to 60 percent slopes, on north-facing side slopes. Included areas make up about 15 percent of the total acreage.

The Falula soil is shallow and somewhat excessively drained. It formed in residuum derived dominantly from sandstone and conglomerate. Slopes are long and convex or concave. The present vegetation is mainly low sagebrush, bluebunch wheatgrass, lanceleaf yellowbrush, and Hood phlox.

Typically, the surface layer is dark reddish brown gravelly loam about 10 inches thick. The underlying material is red extremely gravelly loam about 8 inches thick. Fractured sandstone is at a depth of 18 inches. Depth to sandstone is 10 to 20 inches.

Permeability of the Falula soil is moderate. Available water capacity is about 1 inch to 2 inches. Water supplying capacity is 2 to 5 inches. Effective rooting depth is 10 to 20 inches. Runoff is medium, and the hazard of water erosion is moderate.

The Kearl soil is moderately deep and well drained. It formed in residuum derived dominantly from sandstone. Slopes are long and are slightly concave or convex. The present vegetation is mainly big sagebrush, Sandberg bluegrass, Letterman needlegrass, and lanceleaf yellowbrush.

Typically, the surface layer is dark brown silt loam about 11 inches thick. The subsoil is dark brown loam about 6 inches thick. The substratum is brown loam about 8 inches thick. Fractured sandstone is at a depth of about 25 inches. Depth to sandstone is 20 to 40 inches.

Permeability of the Kearl soil is moderate. Available water capacity is about 4 to 6 inches. Water supplying capacity is 6 to 9 inches. Effective rooting depth is 20 to 40 inches. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used as rangeland and for wildlife habitat.

The potential plant community on the Falula soil is mainly bluebunch wheatgrass, big sagebrush, black sagebrush, and Sandberg bluegrass. The potential plant community on the Kearl soil is mainly bluebunch wheatgrass, antelope bitterbrush, Indian ricegrass, and big sagebrush. The suitability of this unit for rangeland seeding is very poor. The main limitations are depth to bedrock and low available water capacity.

Management practices that maintain or improve the range vegetation include proper grazing use, planned grazing systems, fencing, and stock water development. Shrubs can be controlled by chemical treatment, mechanical treatment, or prescribed burning.

This map unit is in capability unit VIIs-U3, nonirrigated. The Falula soil is in Upland Shallow Loam range site, and the Kearl soil is in Upland Loam range site.

FDF—Flygare gravelly loam, 25 to 50 percent slopes. This very deep, well drained soil is on mountainsides in the northwestern part of the survey area. It formed in colluvium derived dominantly from quartzite. Slopes are long and are convex or concave. They face west. The present vegetation is mainly quaking aspen and an understory of mountain brome, bearded wheatgrass, and goldenrod. Elevation is 7,800 to 8,800 feet. The average annual precipitation is about 25 to 30 inches, the mean annual air temperature is 32 to 39 degrees F, and the average freeze-free season is 45 to 60 days.

Typically, the surface is covered with a mat of partially decomposed leaves and twigs about 1 inch thick. The surface layer is dark brown gravelly loam about 25 inches thick. The subsurface layer is yellowish brown very cobbly loam about 12 inches thick. The subsoil to a depth of 60 inches or more is dark yellowish brown extremely gravelly clay loam.

Included in this unit are about 8 percent Scout very stony loam, 10 to 40 percent slopes, in convex areas on ridgetops; 5 percent Despain gravelly loam, 30 to 60 percent slopes, under shrubs and grasses; and 2 percent

Sumine stony loam, 25 to 50 percent slopes, under shrubs and grasses.

Permeability of this Flygare soil is moderate. Available water capacity is about 5 to 6 inches. Water supplying capacity is 11 to 16 inches. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate.

This unit is woodland, but it is used primarily as rangeland and for wildlife habitat.

This unit is well suited to the production of aspen. The site index for aspen ranges from 68 to 77. The soil in the unit can produce about 4,000 cubic feet, or 6,200 board feet (International rule), of merchantable timber per acre from an even-aged, fully stocked stand of trees 100 years old. Conventional methods of harvesting timber can be used.

The potential understory plant community on this unit is mainly mountain brome, dryland sedges, blue wildrye, and edible valerian.

Management practices suitable for use on this unit are proper grazing use and planned grazing systems.

This map unit is in capability unit VIIe-HA, nonirrigated, and in woodland suitability group 3f.

FEE—Fontreen-Rexmont, very shallow complex, 6 to 40 percent slopes. This map unit is on mountainsides and ridges in the northern part of the Crawford Mountains. Elevation is 6,400 to 8,000 feet. The average annual precipitation is about 10 to 13 inches, the mean annual air temperature is 35 to 39 degrees F, and the average freeze-free season is 50 to 75 days.

This unit is 60 percent Fontreen gravelly silt loam, 10 to 40 percent slopes, and 25 percent Rexmont gravelly loam, 6 to 20 percent slopes. The Fontreen soil is dominantly on north- and east-facing mountainsides, and the Rexmont soil is on ridges. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are about 4 percent Lundy very gravelly loam that has slopes of 25 to 60 percent and is on mountainsides; 3 percent Rexmont gravelly loam that has slopes of 25 to 70 percent and is near ridgetops; 2 percent Highams Variant gravelly loam that has slopes of 6 to 50 percent and is near ridgetops; and 2 percent Vicking silt loam, dry, 4 to 15 percent slopes, in concave basins. Also included are small areas of Rock outcrop and Pancheri silt loam that has slopes of 30 to 50 percent. Included areas make up about 15 percent of the total acreage.

The Fontreen soil is very deep and somewhat excessively drained. It formed in residuum and colluvium derived dominantly from limestone. Slopes are medium to long and are convex or concave. They dominantly face north and east. The present vegetation is mainly bluebunch wheatgrass, big sagebrush, low sagebrush, and lanceleaf yellowbrush.

Typically, the surface layer is brown gravelly silt loam 14 inches thick. The upper 26 inches of the underlying material is brown and light yellowish brown extremely gravelly loam, and the lower part to a depth of 60 inches or more is very pale brown extremely gravelly loam. A layer of lime accumulation is at a depth of 14 to 40 inches.

Permeability of the Fontreen soil is moderately rapid. Available water capacity is about 5 to 6 inches. Water supplying capacity is 6 to 8 inches. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate.

The Rexmont soil is very shallow and somewhat excessively drained. It formed in residuum and colluvium derived dominantly from limestone. Slopes are medium to long and are convex. They face east, south, and west. The present vegetation is mainly black sagebrush, bluebunch wheatgrass, Sandberg bluegrass, and lanceleaf yellowbrush.

Typically, the surface layer is brown gravelly loam 3 inches thick. Below this is brown very gravelly loam 7 inches thick. Limestone is at a depth of 10 inches. Depth to limestone ranges from 8 to 10 inches.

Permeability of the Rexmont soil is moderate. Available water capacity is about 0.5 inch to 2.0 inches. Water supplying capacity is 1 inch to 4 inches. Effective rooting depth is 8 to 10 inches. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used as rangeland and for wildlife habitat.

The potential plant community on this unit is mainly bluebunch wheatgrass, big sagebrush, black sagebrush, and Sandberg bluegrass. The average annual production of air-dry vegetation ranges from 700 to 2,000 pounds. The suitability of the unit for rangeland seeding is very poor. The main limitations are slope and rock fragments on and in the surface layer.

Management practices that maintain or improve the range vegetation include proper grazing use, planned grazing systems, fencing, and stock water development. Shrubs can be controlled by chemical treatment.

This map unit is in capability unit VIIs-U3, nonirrigated. The Fontreen soil is in Upland Stony Loam range site, and the Rexmont soil is in Upland Shallow Loam range site.

FFF—Foxol extremely stony sandy loam, 30 to 60 percent slopes. This shallow, somewhat excessively drained soil is on mountainsides and ridges, extending from southwest of Randolph to the Rich county line. It formed in residuum and colluvium derived dominantly from quartzite. Slopes are long and convex. They dominantly face east. The present vegetation is mainly bluebunch wheatgrass, Nevada bluegrass, and mountain big sagebrush. Elevation is 7,200 to 8,200 feet. The average annual precipitation is about 16 to 24 inches, the mean annual air temperature is 36 to 39 degrees F, and the average freeze-free season is 55 to 70 days.

Typically, the surface layer is dark brown extremely stony sandy loam 7 inches thick. Below this is yellowish brown extremely cobbly loam 9 inches thick. Quartzite is at a depth of about 16 inches. Depth to quartzite ranges from 10 to 20 inches.

Permeability of this Foxol soil is moderate. Available water capacity is about 1 inch to 2 inches. Water supplying capacity is 2 to 8 inches. Effective rooting depth is 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is high.

Included in this unit are about 5 percent Sumine stony loam, 25 to 50 percent slopes, intermingled throughout the unit; 5 percent soils that are similar to this Foxol soil but are on north-facing slopes and are under stands of conifers; 3 percent Rock outcrop on ridgetops; and 2 percent Foxol very stony loam, 10 to 40 percent slopes, in the more gently sloping areas.

This unit is used as rangeland and for wildlife habitat.

The potential plant community on this unit is bluebunch wheatgrass, antelope bitterbrush, basin wildrye, and longtongue muttongrass. The suitability of the unit for rangeland seeding is very poor. The main limitations are low available water capacity, rock fragments in the surface layer, and depth to bedrock.

Management practices suitable for use on this unit are proper grazing use and planned grazing systems.

This map unit is in capability unit VIIs-M3 and in Mountain Shallow Loam range site.

FGE—Foxol very stony loam, 10 to 40 percent slopes. This shallow, somewhat excessively drained soil is on foothills and mountainsides west of Bear Lake. It formed in residuum and colluvium derived dominantly from quartzite. Slopes are long and convex. They face south, east, and west. The present vegetation is mainly bluebunch wheatgrass, big sagebrush, low sagebrush, and lanceleaf yellowsbrush. Elevation is 6,000 to 7,500 feet. The average annual precipitation is about 14 to 24 inches, the mean annual air temperature is 37 to 42 degrees F, and the average freeze-free season is 70 to 85 days.

Typically, 20 to 30 percent of the surface is covered with stones. The surface layer is very dark brown very stony loam about 10 inches thick. The subsoil is brown very cobbly loam about 5 inches thick. Fractured quartzite is at a depth of 15 inches. Depth to quartzite ranges from 10 to 20 inches.

Included in this unit are about 8 percent Rock outcrop; 5 percent Sumine stony loam, 25 to 50 percent slopes; and 2 percent Foxol extremely stony sandy loam, 30 to 60 percent slopes.

Permeability of this Foxol soil is moderate. Available water capacity is about 1 inch to 2 inches. Water supplying capacity is 2 to 8 inches. Effective rooting depth is 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is high.

Most areas of this unit are used as rangeland and for wildlife habitat. A few areas are used for homesite development.

The potential plant community on this unit is bluebunch wheatgrass, antelope bitterbrush, basin wildrye, and longtongue muttongrass. The suitability of the unit for rangeland seeding is very poor. The main limitations are low available water capacity, rock fragments in the surface layer, and depth to bedrock.

Management practices that maintain or improve the range vegetation include proper grazing use, planned grazing systems, fencing, and stock water developments.

If this unit is used for homesite development, the main limitations are depth to bedrock and steepness of slope. Cuts needed to provide essentially level building sites can expose bedrock. Erosion is a hazard in the steeper areas.

Slope is a concern in installing septic tank absorption fields. Absorption lines should be installed on the contour. Effluent from septic tank absorption fields can surface in downslope areas and thus create a hazard to health.

This map unit is in capability unit VIIs-M3, nonirrigated, and in Mountain Shallow Loam range site.

GAD—Gobine silt loam, 1 to 10 percent slopes. This very deep, well drained soil is on undulating to rolling uplands, alluvial fans, and flood plains. It is mainly east of Bear Lake. The soil formed in alluvium derived dominantly from sandstone, conglomerate, and limestone. Slopes are long and convex. They face east, north, and west. The present vegetation is mainly big sagebrush, bluebunch wheatgrass, lanceleaf yellowbrush, phlox, and balsamroot. Elevation is 6,400 to 6,800 feet. The average annual precipitation is about 14 to 16 inches, the mean annual air temperature is 40 to 44 degrees F, and the average freeze-free season is 75 to 90 days.

Typically, the surface layer is brown silt loam about 7 inches thick. The subsoil is brown silt loam about 14 inches thick. The substratum to a depth of 60 inches or more is very pale brown silt loam and pinkish gray loam. A layer of secondary calcium carbonate accumulation is at a depth of about 21 inches.

Included in this unit are about 8 percent Falula gravelly silt loam, 1 to 10 percent slopes, in the convex, slightly higher lying areas; 2 percent Thatcher silt loam, 5 to 10 percent slopes, intermingled throughout the unit; and 2 percent Ellett silt loam, 10 to 30 percent slopes, in convex areas near the edges of this unit.

Permeability of this Gobine soil is moderately slow. Available water capacity is about 10 to 11 inches. Water supplying capacity is 10 to 11 inches. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used as rangeland and for wildlife habitat and nonirrigated crops.

The potential plant community on this unit is mainly bluebunch wheatgrass, antelope bitterbrush, Indian ricegrass, and big sagebrush. The suitability of the unit for rangeland seeding is good.

Practices suitable for use on this unit are proper grazing use and planned grazing systems. Shrubs can be controlled by chemical treatment, mechanical treatment, or prescribed burning.

If this unit is used for nonirrigated crops, the main limitations are the length of the growing season and the high hazard of erosion. Seedbed preparation should be on the contour or across the slope where practical. Maintaining crop residue on or near the surface reduces runoff, reduces soil blowing, and helps to maintain soil tilth and organic matter content. This unit produces about 25 bushels of wheat per acre.

This map unit is in capability unit IVe-U, nonirrigated, and in Upland Loam range site.

GBE—Gridge-Rock outcrop complex, 25 to 40 percent slopes. This map unit is on stream-cut canyon walls throughout the survey area. The present vegetation is mainly big sagebrush, bluebunch wheatgrass, Indian ricegrass, and lanceleaf yellowbrush. Elevation is 6,400 to 7,400 feet. The average annual precipitation is about 13 to 18 inches, the mean annual air temperature is 37 to 41 degrees F, and the average freeze-free season is 55 to 80 days.

This unit is 80 percent Gridge stony loam, 25 to 40 percent slopes, and 10 percent Rock outcrop. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are about 7 percent Cutoff gravelly loam, 25 to 60 percent slopes, intermingled throughout the unit and 3 percent Dagan gravelly silt loam, 25 to 40 percent slopes, on north- and east-facing side slopes.

The Gridge soil is shallow and somewhat excessively drained. It formed in residuum and colluvium derived dominantly from sandstone and siltstone. Slopes are dominantly medium in length and are convex. They face south and west. Typically, 5 to 10 percent of the surface is covered with angular stones. The surface layer is red stony loam about 6 inches thick. The next layer is dark red silt loam about 11 inches thick. Sandstone is at a depth of 17 inches. Depth to sandstone ranges from 10 to 20 inches.

Permeability of the Gridge soil is moderate. Available water capacity is about 2 to 3 inches. Water supplying capacity is 4 to 7 inches. Effective rooting depth is 10 to 20 inches. Runoff is very rapid, and the hazard of water erosion is very high.

Rock outcrop consists of barren areas of exposed sandstone. It occurs mainly as ledges and cliffs. Runoff is very rapid.

This unit is used as rangeland and for wildlife habitat.

The potential plant community on this unit is mainly bluebunch wheatgrass, big sagebrush, black sagebrush, and Sandberg bluegrass. The suitability of the unit for rangeland seeding is very poor. The main limitations are slope and depth to bedrock.

Management practices that maintain or improve the range vegetation include proper grazing use, planned grazing systems, fencing, and stock water developments.

The Gridge soil is in capability unit VIIs-U3, nonirrigated, and in Upland Shallow Loam range site.

GCE—Guilder loam, 15 to 25 percent slopes. This deep, well drained soil is on foothills and mountainsides in the southwestern part of Rich County. It formed in residuum and alluvium derived dominantly from sandstone and shale. Slopes are long and slightly concave. They dominantly face north and east. The present vegetation is mainly western wheatgrass, big sagebrush, black sagebrush, and lanceleaf yellowbrush. Elevation is 6,800 to 7,650 feet. The average annual precipitation is about 16 to 18 inches, the mean annual air temperature is 35 to 38 degrees F, and the average freeze-free season is 70 to 90 days.

Typically, the surface layer is dark brown loam about 11 inches thick. The upper 23 inches of the subsoil is red silty clay loam and silty clay, and the lower 20 inches is light red silty clay loam. Soft, weathered, calcareous sandstone is at a depth of 54 inches. Depth to sandstone ranges from 50 to 60 inches.

Included in this unit are about 4 percent Bullnel loam, 15 to 30 percent slopes, near the ridgetops; 3 percent Ercan loam, 15 to 30 percent slopes, that is on north- and east-facing side slopes and supports stands of aspen; and 2 percent Etchen very cobbly loam, 25 to 40 percent slopes, on south- and west-facing side slopes.

Permeability of this Guilder soil is slow. Available water capacity is about 8 to 10 inches. Water supplying capacity is 11 to 14 inches. Effective rooting depth is 50 to 60 inches. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used as rangeland and for wildlife habitat.

The potential plant community on this unit is mainly bluebunch wheatgrass, basin wildrye, bearded wheatgrass, and muttongrass. The suitability of the unit for rangeland seeding is fair. The main limitation is slope.

Management practices suitable for use on this unit are proper grazing use and planned grazing systems. Shrubs can be controlled by chemical treatment, mechanical treatment, or prescribed burning.

This map unit is in capability unit VIe-M, nonirrigated, and in Mountain Loam range site.

HAB—Hades silt loam, 3 to 6 percent slopes. This very deep, well drained soil is on alluvial fans, mainly south and east of Bear Lake. It formed in alluvium derived dominantly from sandstone and quartzite. Slopes are long and concave. They face north and east. The

present vegetation is mainly big sagebrush, rabbitbrush, bluebunch wheatgrass, western wheatgrass, and yarrow. Elevation is 6,000 to 7,000 feet. The average annual precipitation is about 16 to 20 inches, the mean annual air temperature is 38 to 42 degrees F, and the average freeze-free season is 70 to 80 days.

Typically, the surface layer is very dark brown silt loam about 24 inches thick. The subsoil is brown silty clay loam about 28 inches thick. The substratum to a depth of 60 inches or more is yellowish brown very gravelly loam.

Included in this unit are about 10 percent Despain Variant gravelly loam, 1 to 3 percent slopes, on alluvial fans near the mouth of small drainageways; 5 percent Thatcher silt loam, warm, 3 to 6 percent slopes, in convex areas; and 5 percent soils that are similar to this Hades soil but have slopes of 1 to 3 percent.

Permeability of this Hades soil is moderately slow. Available water capacity is about 9 to 10 inches. Water supplying capacity is 12 to 15 inches. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight.

This unit is used for irrigated and nonirrigated crops, as rangeland, and for wildlife habitat. The main irrigated crops are alfalfa, small grain, and pasture, and the main nonirrigated crops are wheat and barley.

This unit is well suited to irrigated and nonirrigated crops. It is limited mainly by the length of the growing season. Maintaining crop residue on or near the surface reduces runoff, reduces soil blowing, and helps to maintain soil tilth and organic matter content. Tillage should be kept to a minimum. If this unit is irrigated, it produces about 4 tons of alfalfa per acre, 25 bushels of barley per acre, or 9 animal-unit-months of forage per acre. The unit also produces about 30 bushels of nonirrigated wheat per acre.

The potential plant community on this unit is mainly bluebunch wheatgrass, bearded wheatgrass, and basin wildrye. The suitability of the unit for rangeland seeding is good.

Management practices that maintain or improve the range vegetation include proper grazing use, planned grazing systems, fencing, and stock water developments. Shrubs can be controlled by chemical treatment, mechanical treatment, or prescribed burning.

This map unit is in capability units IIIe-3, irrigated, and VIe-M, nonirrigated. It is in Mountain Loam (Shrub) range site.

HBD—Hawkins silty clay loam, 6 to 25 percent slopes. This very deep, well drained soil is on mountainsides south and west of Bear Lake. It formed in alluvium and colluvium that are derived dominantly from tuffaceous material and are high in content of volcanic ash. Slopes are long and convex or concave. They face north, east, and south. The present vegetation is mainly big sagebrush, slender wheatgrass, Sandberg bluegrass, and antelope bitterbrush. Elevation is 6,000 to 7,500 feet. The average annual precipitation is about 16 to 24 inches, the mean annual air temperature is 37 to 43 degrees F, and the average freeze-free season is 70 to 85 days.

Typically, the surface layer is very dark grayish brown silty clay loam about 10 inches thick. The subsoil is dark grayish brown clay about 17 inches thick. The substratum to a depth of 60 inches or more is light brownish gray silty clay loam. Cracks extend to a depth of 30 to 40 inches late in summer. They are at least 1 centimeter wide at a depth of 20 inches.

Included in this unit are about 5 percent Obray silty clay loam and 5 percent Yeates Hollow stony loam. These soils have slopes of 6 to 25 percent and are intermingled throughout the unit.

Permeability of this Hawkins soil is slow. Available water capacity is about 10 to 11 inches. Water supplying capacity is 12 to 19 inches. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate.

Most areas of this unit are used as rangeland and for wildlife habitat. A few areas are used for homesite development.

The potential plant community on this unit is mainly slender wheatgrass, bluebunch wheatgrass, western wheatgrass, and Idaho fescue. The suitability of the unit for rangeland seeding is good.

Management practices suitable for use on this unit are proper grazing use and planned grazing systems. Shrubs can be controlled by chemical treatment, mechanical treatment, or prescribed burning.

Population growth has resulted in increased construction of homes on this unit. The main limitations for use as homesites are slow permeability, potential for shrinking and swelling, and steepness of slope. Erosion is a hazard in the steeper areas; therefore, only the part of the site that is used for construction should be disturbed. Buildings and roads should be designed to offset the limited ability of the soil in this unit to support a load. The effects of shrinking and swelling can be minimized by using proper engineering designs and by backfilling with material that has low shrink-swell potential.

Slow permeability increases the possibility of failure of septic tank absorption fields. This limitation can be overcome by increasing the size of the absorption field. Slope is a concern in installing septic tank absorption fields. Absorption lines should be installed on the contour.

This map unit is in capability unit VIe-M5, nonirrigated, and in Mountain Clay range site.

HC—Hival silty clay loam. This very deep, poorly drained soil is on alluvial fans and on the Saleratus Creek flood plain. It formed in alluvium derived dominantly from sandstone and shale. Slopes are 0 to 2

percent and are long. The present vegetation is mainly broadleaf sedges, bluegrass, foxtail, wiregrass, and hairgrass. Elevation is 6,250 to 6,400 feet. The average annual precipitation is about 9 to 11 inches, the mean annual air temperature is 38 to 42 degrees F, and the average freeze-free season is 59 to 65 days.

Typically, the surface layer is dark brown silty clay loam about 5 inches thick. The subsoil is dark brown and brown clay about 17 inches thick. The substratum to a depth of 60 inches or more is reddish brown and yellowish red clay.

Included in this unit are about 8 percent Saleratus loam; 5 percent Nevka loam, wet; and 2 percent Cowco silty clay loam, saline-alkali, 0 to 3 percent slopes. These soils are intermingled throughout the unit. Also included is 2 percent Bear Lake silt loam that has slopes of 0 to 1 percent and is in old stream channels.

Permeability of this Hival soil is very slow. Available water capacity is about 10 to 11 inches. Effective rooting depth is limited by a seasonal high water table that is at a depth of 18 to 30 inches from May to July. Runoff is very slow, and the hazard of water erosion is slight. This soil is subject to rare periods of flooding.

This unit is used for irrigated hay and pasture and for wildlife habitat.

If this unit is used for hay and pasture, the main limitations are the high water table, the length of the growing season, and very slow permeability. Plants that tolerate a seasonal high water table should be selected if drainage is not provided. Because of the very slow permeability of the soil in the unit, applications of irrigation water should be regulated so that water does not stand on the surface. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and to protect the soil from erosion. If this unit is irrigated, it produces 6 animal-unit-months of forage per acre.

This map unit is in capability unit IVw-45, irrigated.

HDC—Horrocks gravelly loam, 6 to 10 percent slopes. This deep, well drained soil is on mountainsides and uplands in the southwestern part of Rich County. It formed in residuum and colluvium derived dominantly from conglomerate and sandstone. Slopes are long and slightly convex. They dominantly face east. The present vegetation is mainly big sagebrush, prairie junegrass, antelope bitterbrush, and western wheatgrass. Elevation is 6,800 to 7,600 feet. The average annual precipitation is about 18 to 21 inches, the mean annual air temperature is 35 to 38 degrees F, and the average freeze-free season is 70 to 90 days.

Typically, the surface layer is very dark brown gravelly loam about 11 inches thick. The subsoil is strong brown and reddish brown very gravelly sandy clay loam about 13 inches thick. The substratum is reddish brown gravelly sandy loam about 17 inches thick. Sandstone is at a depth of 41 inches. Depth to bedrock ranges from 40 to 50 inches.

Included in this unit are about 2 percent Bullnel loam, 15 to 30 percent slopes, near ridgetops; 2 percent Etchen very cobbly loam, 25 to 40 percent slopes, intermingled throughout the unit; and 1 percent St. Marys loam, 10 to 40 percent slopes, intermingled throughout the unit.

Permeability of this Horrocks soil is moderate. Available water capacity is about 4 to 5 inches. Water supplying capacity is 7 to 10 inches. Effective rooting depth is 40 to 50 inches. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used as rangeland and for wildlife habitat.

The potential plant community on this unit is mainly bluebunch wheatgrass, oniongrass, antelope bitterbrush, and big sagebrush. The suitability of the unit for rangeland seeding is fair. The main limitations are low available water capacity and rock fragments in the surface layer.

Management practices suitable for use on this unit are proper grazing use and planned grazing systems. Shrubs can be controlled by chemical treatment, mechanical treatment, or prescribed burning.

This map unit is in capability unit VIe-M, nonirrigated, and in Mountain Stony Loam range site.

HEF—Hourglass silt loam, 25 to 50 percent slopes. This deep, well drained soil is on mountainsides west of Bear Lake. It formed in residuum and colluvium derived dominantly from limestone. Slopes are long and convex. They dominantly face north and east. The present vegetation is mainly Douglas-fir and subalpine fir with an understory of myrtle pachystima and heartleaf arnica. Elevation is 6,500 to 9,000 feet. The average annual precipitation is about 25 to 35 inches, the mean annual air temperature is 31 to 39 degrees F, and the average freeze-free season is 35 to 70 days.

Typically, the surface is covered with a mat of partially decomposed leaves and twigs about 2 inches thick. The surface layer is dark brown silt loam and gravelly loam about 13 inches thick. The subsoil is dark brown cobbly silty clay loam about 12 inches thick. The substratum is dark brown extremely cobbly loam about 16 inches thick. Fractured limestone is at a depth of about 41 inches. Depth to limestone ranges from 40 to 60 inches.

Included in this unit is about 6 percent Agassiz stony loam that is very shallow, has slopes of 25 to 60 percent, and is under shrubs and grasses. Also included are 3 percent Flygare gravelly loam, 25 to 50 percent slopes, under aspen and 1 percent Rock outcrop.

Permeability of this Hourglass soil is moderately slow. Available water capacity is about 4.5 to 5.5 inches. Water supplying capacity is 11 to 16 inches. Effective rooting depth is 40 to 60 inches. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used as woodland and for wildlife habitat.

This unit is poorly suited to the production of Douglas-fir and subalpine fir. Based on a site index of 35, the potential production per acre of merchantable timber is 1,440 cubic feet, or 5,200 board feet (International rule) from an even-aged, fully stocked stand of trees 100 years old.

This map unit is in capability unit VIIe-HC, nonirrigated, and in woodland suitability group 7f1.

JAE—Jebo very gravelly loam, 15 to 25 percent slopes. This moderately deep, somewhat excessively drained soil is on foothills and mountain ridges, mainly in the northwestern part of Rich County. It formed in colluvium derived dominantly from sandstone and conglomerate. Slopes are long and convex. They face south and west. The present vegetation is mainly big sagebrush, bluebunch wheatgrass, lanceleaf yellowbrush, and antelope bitterbrush. Elevation is 6,000 to 8,000 feet. The average annual precipitation is about 12 to 18 inches, the mean annual air temperature is 35 to 42 degrees F, and the average freeze-free season is 50 to 85 days.

Typically, the surface layer is dark brown very gravelly loam about 11 inches thick. The subsoil is reddish brown very gravelly loam about 7 inches thick. The substratum is red extremely gravelly sandy loam about 8 inches thick. Fractured sandstone is at a depth of 26 inches. Depth to sandstone ranges from 20 to 40 inches.

Included in this unit are about 4 percent Dagan gravelly silt loam, 25 to 40 percent slopes, on north- and east-facing side slopes; 5 percent Dennot loam, 25 to 40 percent slopes, on toe slopes; and 4 percent Falula very gravelly loam, 4 to 25 percent slopes, on ridges.

Permeability of this Jebo soil is moderate. Available water capacity is about 2 to 3 inches. Water supplying capacity is 4 to 8 inches. Effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high.

Most areas of this unit are used as rangeland and for wildlife habitat. A few areas are used for homesite development.

The potential plant community on this unit is mainly bluebunch wheatgrass, black sagebrush, muttongrass, and antelope bitterbrush. The suitability of the unit for rangeland seeding is poor. The main limitations are low available water capacity, depth to bedrock, rock fragments in the surface layer, and slope.

Management practices that maintain or improve the range vegetation include proper grazing use, planned grazing systems, fencing, and stock water developments. Shrubs can be controlled by chemical treatment, mechanical treatment, or prescribed burning.

If this unit is used for homesite development, the main limitations are depth to bedrock and steepness of slope. Erosion is a hazard in the steeper areas; therefore, only the part of the site that is used for construction should be disturbed.

Slope is a concern in installing septic tank absorption fields. Absorption lines should be installed on the contour. Effluent from septic tank absorption fields can surface in downslope areas and thus create a hazard to health.

This map unit is in capability unit VIIs-U4, nonirrigated, and in Upland Stony Loam range site.

JAF—Jebo very gravelly loam, 25 to 40 percent slopes. This moderately deep, somewhat excessively drained soil is on foothills and mountainsides in the northwestern part of Rich County. It formed in colluvium derived dominantly from sandstone and conglomerate. Slopes are long and concave or convex. They face south and west. The present vegetation is mainly low sagebrush, bluebunch wheatgrass, lanceleaf yellowbrush, and antelope bitterbrush. Elevation is 6,000 to 8,000 feet. The average annual precipitation is about 12 to 18 inches, the mean annual air temperature is 35 to 42 degrees F, and the average freeze-free season is 50 to 85 days.

Typically, the surface layer is dark brown very gravelly loam about 10 inches thick. The subsoil is brown very gravelly loam about 6 inches thick. The substratum is brown very cobbly loam and reddish yellow extremely cobbly sandy loam 19 inches thick. Fractured conglomerate is at a depth of 35 inches. Depth to conglomerate ranges from 20 to 40 inches.

Included in this unit are about 4 percent Falula very gravelly loam, 4 to 25 percent slopes, on ridges; 2 percent Solak gravelly loam, 10 to 50 percent slopes, on ridges; and 4 percent Vanni loam, 10 to 30 percent slopes, on mountainsides.

Permeability of this Jebo soil is moderate. Available water capacity is about 2 to 3 inches. Water supplying capacity is 4 to 8 inches. Effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high.

Most areas of this unit are used as rangeland and for wildlife habitat. A few areas are used for homesite development.

The potential plant community on this unit is mainly bluebunch wheatgrass, black sagebrush, muttongrass, and antelope bitterbrush. The suitability of the unit for rangeland seeding is poor. The main limitations are low available water capacity, depth to bedrock, rock fragments in the surface layer, and slope.

Management practices that maintain or improve the range vegetation include proper grazing use, planned grazing systems, fencing, and stock water developments. Shrubs can be controlled by chemical treatment.

If this unit is used for homesite development, the main limitations are depth to bedrock and steepness of slope. Cuts needed to provide essentially level building sites can expose bedrock. Erosion is a hazard in the steeper areas; therefore, only the part of the site that is used for construction should be disturbed.

Slope is a concern in installing septic tank absorption fields. Absorption lines should be installed on the contour. Effluent from septic tank absorption fields can surface in downslope areas and thus create a hazard to health.

This map unit is in capability unit VIIs-U4, nonirrigated, and in Upland Stony Loam range site.

KAF—Kamack loam, 30 to 60 percent slopes. This deep, well drained soil is on mountainsides, mainly along the southwestern boundary of Rich County. It formed in residuum derived dominantly from sandstone. Slopes are medium to long and are convex or concave. They dominantly face north. The present vegetation is mainly Engelmann spruce, subalpine fir, and Douglas-fir. Elevation is 7,000 to 8,500 feet. The average annual precipitation is about 25 to 35 inches, the mean annual air temperature is 31 to 36 degrees F, and the average freeze-free season is 40 to 55 days.

Typically, the surface is covered with a mat of partially decomposed needles and twigs 2 inches thick. The surface layer is dark brown loam 13 inches thick. The subsurface layer is dark brown sandy loam 7 inches thick. The subsoil is dark reddish brown very gravelly sandy clay loam 21 inches thick. Sandstone is at a depth of 41 inches. Depth to sandstone ranges from 40 to 60 inches.

Permeability of this Kamack soil is moderate. Available water capacity is about 2 to 3 inches. Water supplying capacity is 8 to 12 inches. Effective rooting depth is 40 to 60 inches. Runoff is medium, and the hazard of water erosion is moderate.

Included in this unit are about 18 percent soils that are similar to this Kamack soil but have slopes of 10 to 30 percent; 10 percent moderately deep, well drained very gravelly sandy loam that is intermingled throughout the unit; and 2 percent Rock outcrop on ridgetops.

This soil is used as woodland and for wildlife habitat.

Management practices and capability classification are not provided for this unit (all in National Forest).

KBD—Kearl loam, 4 to 15 percent slopes. This moderately deep, well drained soil is on foothills east and south of Bear Lake. It formed in residuum and colluvium derived dominantly from sandstone. Slopes are long and convex or concave. The present vegetation is mainly big sagebrush, bluebunch wheatgrass, lanceleaf yellowbrush, snowberry, and arrowleaf balsamroot. Elevation is 6,200 to 7,500 feet. The average annual precipitation is about 12 to 16 inches, the mean annual air temperature is 38 to 44 degrees F, and the average freeze-free season is 60 to 80 days.

Typically, the surface layer is dark reddish loam about 13 inches thick. The subsoil is dark red loam about 6 inches thick. The substratum is red fine sandy loam about 17 inches thick. Sandstone is at a depth of about 36 inches. Depth to sandstone ranges from 20 to 40 inches.

Included in this unit are about 10 percent Thatcher silt loam, 5 to 10 percent slopes, in slightly concave areas; 3 percent Solak gravelly loam, 10 to 50 percent slopes, on ridges; 2 percent Lonjon silt loam, 2 to 10 percent slopes.

Permeability of this Kearl soil is moderate. Available water capacity is about 5 to 6 inches. Water supplying capacity is 8 to 9 inches. Effective rooting depth is 20 to 40 inches. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used as rangeland and for wildlife habitat and some nonirrigated wheat.

The potential plant community on this unit is mainly bluebunch wheatgrass, antelope bitterbrush, Indian ricegrass, and big sagebrush. The suitability of the unit for rangeland seeding is fair. The main limitations are depth to bedrock and slope.

Practices suitable for use on this unit are proper grazing use and planned grazing systems. Shrubs can be controlled by chemical treatment, mechanical treatment, or prescribed burning.

If this unit is used for nonirrigated crops, the main limitation is depth to bedrock. A wheat-fallow system should be used. Seedbed preparation should be on the contour or across the slope where practical. Maintaining crop residue on or near the surface reduces runoff, reduces soil blowing, and helps to maintain soil tilth and organic matter content. Tillage should be kept to a minimum.

This map unit is in capability unit VIe-U3, nonirrigated, and in Upland Loam range site.

KBE—Kearl loam, 15 to 25 percent slopes. This moderately deep, well drained soil is on foothills east and south of Bear Lake. It formed in residuum and colluvium derived dominantly from sandstone. Slopes are long and convex or concave. The present vegetation is mainly big sagebrush, bluebunch wheatgrass, lanceleaf yellowbrush, snowberry, and arrowleaf balsamroot. Elevation is 6,200 to 7,500 feet. The average annual precipitation is about 12 to 16 inches, the mean annual air temperature is 38 to 44 degrees F, and the average freeze-free season is 60 to 80 days.

Typically, the surface layer is dark brown loam about 13 inches thick. The subsoil is brown loam about 8 inches thick. The substratum is light brown and reddish yellow loam about 16 inches thick. Sandstone is at a depth of about 37 inches. Depth to sandstone ranges from 20 to 40 inches.

Included in this unit are about 7 percent Thatcher silt loam, 10 to 20 percent slopes, intermingled throughout the unit; 6 percent Solak gravelly loam, 10 to 50 percent slopes, on ridges; and 2 percent Rock outcrop.

Permeability of this Kearl soil is moderate. Available water capacity is about 3.5 to 5 inches. Water supplying

capacity is 7 to 9 inches. Effective rooting depth is 20 to 40 inches. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used as rangeland and for wildlife habitat.

The potential plant community on this unit is mainly bluebunch wheatgrass, antelope bitterbrush, Indian ricegrass, and big sagebrush. The suitability of the unit for rangeland seeding is fair. The main limitations are slope, depth to bedrock, and low available water capacity.

Management practices suitable for use on this unit are proper grazing use and planned grazing systems. Shrubs can be controlled by chemical treatment, mechanical treatment, or prescribed burning.

This map unit is in capability unit VIe-U3, nonirrigated, and in Upland Loam range site.

KBF—Kearl loam, 25 to 40 percent slopes. This moderately deep, well drained soil is on foothills, mainly east and south of Bear Lake. It formed in residuum and colluvium derived dominantly from sandstone. Slopes are long and convex or concave. They face east, west, and north. The present vegetation is mainly big sagebrush, bluebunch wheatgrass, lanceleaf yellowbrush, snowberry, and phlox. Elevation is 6,200 to 7,500 feet. The average annual precipitation is about 12 to 16 inches, the mean annual air temperature is 38 to 44 degrees F, and the average freeze-free season is 60 to 80 days.

Typically, the surface layer is dark brown loam about 11 inches thick. The subsoil is dark reddish brown loam about 9 inches thick. The substratum is reddish brown loam about 15 inches thick. Sandstone is at a depth of about 35 inches. Depth to sandstone ranges from 20 to 40 inches.

Included in this unit are about 5 percent Dagan gravelly silt loam, 25 to 40 percent slopes, on short south-facing side slopes and 5 percent Solak gravelly loam, 10 to 50 percent slopes, on ridges.

Permeability of this Kearl soil is moderate. Available water capacity is about 5 to 6 inches. Water supplying capacity is 8 to 9 inches. Effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high.

This unit is used as rangeland and for wildlife habitat.

The potential plant community on this unit is mainly bluebunch wheatgrass, antelope bitterbrush, Indian ricegrass, and big sagebrush. The suitability of the unit for rangeland seeding is poor. The main limitation is slope.

Management practices suitable for use on this unit are proper grazing use and planned grazing systems. Shrubs can be controlled by chemical treatment.

This map unit is in capability unit VIe-U3, nonirrigated, and in Upland Loam range site.

KCD—Kearl-Richville, dry complex, 4 to 15 percent slopes. This map unit is on gently rolling to hilly uplands in the southern part of Rich County. The present vegetation is mainly Nevada bluegrass, lanceleaf yellowbrush, and western wheatgrass. Elevation is 6,800 to 7,100 feet. The average annual precipitation is about 12 to 15 inches, the mean annual air temperature is 37 to 39 degrees F, and the average freeze-free season is 55 to 65 days.

This unit is 45 percent Kearl sandy loam, 4 to 15 percent slopes, and 40 percent Richville loam, dry, 4 to 8 percent slopes. The Kearl soil is dominantly on broad ridgetops that are convex, and the Richville soil is on the sides of ridges. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are about 6 percent shallow soils that are underlain by bedrock and are on ridges; 3 percent soils, intermingled throughout the unit, that are similar to the Kearl soil but are yellower; 3 percent Bullnel loam, 4 to 15 percent slopes, on east-facing side slopes; and 2 percent Murphy clay loam that has slopes of 4 to 8 percent and is intermingled throughout the unit. Also included are small areas of Hival silty clay loam that has slopes of 0 to 2 percent and is on alluvial fans and stream bottoms. Included areas make up about 15 percent of the total acreage.

The Kearl soil is moderately deep and well drained. It formed in residuum derived dominantly from sandstone. Slopes are long and convex. Typically, the surface layer is dark brown sandy loam 16 inches thick. The subsoil is reddish brown loam 5 inches thick. The substratum is yellowish red loam 7 inches thick. Weathered sandstone is at a depth of 28 inches. Depth to sandstone ranges from 20 to 40 inches.

Permeability of the Kearl soil is moderate. Available water capacity is about 4 to 6 inches. Water supplying capacity is 6 to 8 inches. Effective rooting depth is 20 to 40 inches. Runoff is medium, and the hazard of water erosion is moderate.

The Richville soil is moderately deep and well drained. It formed in residuum derived dominantly from sandstone and siltstone. Slopes are long and slightly convex to concave. Typically, the surface layer is dark brown loam 3 inches thick. The subsoil is dark brown clay loam 7 inches thick. The substratum is yellowish red clay loam 14 inches thick. Weathered sandstone is at a depth of 24 inches. Depth to sandstone ranges from 20 to 40 inches.

Permeability of the Richville soil is moderately slow. Available water capacity is about 4 to 6 inches. Water supplying capacity is 6 to 9 inches. Effective rooting depth is 20 to 40 inches. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used as rangeland and for wildlife habitat.

The potential plant community on this unit is antelope bitterbrush, Indian ricegrass, bluebunch wheatgrass, and Nevada bluegrass. The suitability of the unit for

rangeland seeding is fair. The main limitations are moderate available water capacity and depth to bedrock.

Practices suitable for use on this unit are proper grazing use and planned grazing systems. Shrubs can be controlled by chemical treatment, mechanical treatment, or prescribed burning.

This map unit is in capability unit VIe-U3, nonirrigated, and in Upland Loam range site.

LAD—Lakridge silt loam, 5 to 10 percent slopes. This moderately deep, well drained soil is on foothills east of Bear Lake. It formed in loess deposits and local alluvium derived from a wide variety of parent material. Slopes are long and convex or concave. They face south and west. The present vegetation is mainly bluebunch wheatgrass, big sagebrush, lanceleaf yellowbrush, and Hood phlox. Elevation is 6,800 to 7,300 feet. The average annual precipitation is about 14 to 16 inches, the mean annual air temperature is 37 to 40 degrees F, and the average freeze-free season is 60 to 75 days.

Typically, the surface layer is dark brown silt loam about 8 inches thick. The subsoil is dark yellowish brown silt loam about 6 inches thick. The substratum is very pale brown loam about 13 inches thick. A lime-cemented hardpan is at a depth of 27 inches. Depth to the hardpan ranges from 20 to 40 inches.

Included in this unit are about 5 percent Kearl loam, 4 to 15 percent slopes, near shallow drainageways; 5 percent Falula gravelly silt loam, 1 to 10 percent slopes, intermingled throughout the unit; and 5 percent Dennot very gravelly loam, 4 to 15 percent slopes, in the higher lying areas.

Permeability of this Lakridge soil is moderate. Available water capacity is about 4 to 6 inches. Water supplying capacity is 7.5 to 9.5 inches. Effective rooting depth is 20 to 40 inches. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used for nonirrigated crops, as rangeland, and for wildlife habitat. The principal crop is wheat.

This unit is well suited to nonirrigated crops. Seedbed preparation should be on the contour or across the slope where practical. Maintaining crop residue on or near the surface reduces runoff, reduces soil blowing, and helps to maintain soil tilth and organic matter content. Tillage should be kept to a minimum. This unit produces about 25 bushels of wheat per acre.

The potential plant community on this unit is mainly bluebunch wheatgrass, antelope bitterbrush, Indian ricegrass, and big sagebrush. The suitability of the unit for rangeland seeding is fair. The main limitation is depth to the hardpan.

Practices suitable for use on this unit are proper grazing use and planned grazing systems. Shrubs can be controlled by chemical treatment, mechanical treatment, or prescribed burning.

This map unit is in capability unit IVe-U3, nonirrigated, and in Upland Loam range site.

LBC—Lariat fine sandy loam, 4 to 10 percent slopes. This moderately deep, well drained soil is on uplands and foothills in the south-central part of Rich County. It formed in residuum derived dominantly from sandstone. Slopes are long and convex. The present vegetation is mainly big sagebrush, western wheatgrass, bottlebrush squirreltail, and lanceleaf yellowbrush. Elevation is 6,300 to 7,000 feet. The average annual precipitation is about 9 to 12 inches, the mean annual air temperature is 38 to 40 degrees F, and the average freeze-free season is 55 to 80 days.

Typically, the surface layer is dark brown fine sandy loam about 9 inches thick. The upper 14 inches of the underlying material is pink loam, and the lower part is light brown loam 9 inches thick. Fractured sandstone is at a depth of 32 inches. Depth to sandstone ranges from 20 to 40 inches.

Included in this unit are about 5 percent Alhark loam, 6 to 15 percent slopes, commonly on northeast-facing side slopes; 3 percent Rock outcrop on ridges; 2 percent Neponset sandy loam, 6 to 10 percent slopes, intermingled throughout the unit; and 2 percent Pancheri silt loam, cool, 5 to 10 percent slopes, in small convex areas near the edges of this unit.

Permeability of this Lariat soil is moderately rapid. Available water capacity is about 4 to 5 inches. Water supplying capacity is 6 to 8 inches. Effective rooting depth is 20 to 40 inches. Runoff is slow to medium, and the hazard of water erosion is moderate.

This unit is used as rangeland and for wildlife habitat.

The potential plant community on this unit is mainly bluebunch wheatgrass, needleandthread, big sagebrush, and bottlebrush squirreltail. The suitability of the unit for rangeland seeding is fair. The main limitations are low available water capacity, depth to bedrock, and low precipitation.

Practices suitable for use on this unit are proper grazing use and planned grazing systems. Shrubs can be controlled by chemical treatment, mechanical treatment, or prescribed burning.

This map unit is in capability unit VIs-S, nonirrigated, and in Semidesert Loam range site.

LCD—Lonjon silt loam, 2 to 10 percent slopes. This moderately deep, well drained soil is on foothills east and south of Bear Lake. It formed in residuum and some eolian deposits derived dominantly from sandstone. Slopes are long and concave or convex. They face north. The present vegetation is mainly big sagebrush, bluebunch wheatgrass, antelope bitterbrush, and Utah serviceberry. Elevation is 6,200 to 7,500 feet. The average annual precipitation is about 12 to 16 inches, the mean annual air temperature is 37 to 42 degrees F, and the average freeze-free season is 70 to 80 days.

Typically, the surface layer is dark brown silt loam about 10 inches thick. The subsoil is yellowish brown gravelly silt loam about 6 inches thick. The substratum is very pale brown extremely gravelly loam about 14 inches thick. Calcareous sandstone is at a depth of 30 inches. Depth to bedrock ranges from 20 to 40 inches.

Included in this unit are about 7 percent Kearl loam, 4 to 15 percent slopes, and 3 percent Falula very gravelly loam, 4 to 25 percent slopes. These soils are intermingled throughout the unit.

Permeability of this Lonjon soil is moderate. Available water capacity is about 2 to 4 inches. Water supplying capacity is 4 to 8 inches. Effective rooting depth is 20 to 40 inches. Runoff is slow, and the hazard of water erosion is moderate.

This unit is used as rangeland and for wildlife habitat.

The potential plant community on this unit is mainly bluebunch wheatgrass, black sagebrush, muttongrass, and antelope bitterbrush. The suitability of the unit for rangeland seeding is poor. The main limitations are low available water capacity and depth to bedrock.

Management practices that maintain or improve the range vegetation include proper grazing use, planned grazing systems, fencing, and stock water developments. Shrubs can be controlled by chemical treatment, mechanical treatment, or prescribed burning.

This map unit is in capability unit VIs-U4, nonirrigated, and in Upland Stony Loam range site.

LCE—Lonjon silt loam, 10 to 30 percent slopes. This moderately deep, well drained soil is on foothills east and south of Bear Lake. It formed in residuum, colluvium, and some eolian deposits derived dominantly from sandstone. Slopes are long and concave or convex. They face north, east, and west. The present vegetation is mainly big sagebrush, bluebunch wheatgrass, antelope bitterbrush, and Utah serviceberry. Elevation is 6,200 to 7,500 feet. The average annual precipitation is about 12 to 16 inches, the mean annual air temperature is 37 to 42 degrees F, and the average freeze-free season is 70 to 80 days.

Typically, the surface layer is very dark grayish brown silt loam about 10 inches thick. The subsoil is dark grayish brown gravelly loam about 6 inches thick. The substratum is light brownish gray very gravelly loam about 11 inches thick. Calcareous sandstone is at a depth of about 27 inches. Depth to bedrock ranges from 20 to 40 inches.

Included in this unit are about 5 percent Kearl loam, 15 to 25 percent slopes, intermingled throughout the unit and 5 percent Solak gravelly loam, 10 to 50 percent slopes, dominantly on ridges.

Permeability of this Lonjon soil is moderate. Available water capacity is about 2 to 4 inches. Water supplying capacity is 4 to 8 inches. Effective rooting depth is 20 to 40 inches. Runoff is medium, and the hazard of water erosion is high.

This unit is used as rangeland and for wildlife habitat.

The potential plant community on this unit is mainly bluebunch wheatgrass, black sagebrush, muttongrass, and antelope bitterbrush. The suitability of the unit for rangeland seeding is poor. The main limitations are low available water capacity and depth to bedrock.

Management practices that maintain or improve the range vegetation include proper grazing use, planned grazing systems, fencing, and stock water developments. Shrubs can be controlled by chemical treatment, mechanical treatment, or prescribed burning.

This map unit is in capability unit VIs-U4, nonirrigated, and in Upland Stony Loam range site.

LDD—Lucky Star gravelly loam, 8 to 25 percent slopes. This very deep, well drained soil is on mountainsides along the western edge of Rich County. It formed in colluvium derived dominantly from conglomerate and sandstone. Slopes are long and convex or concave. Slopes above an elevation of 7,200 feet face all directions, and those below that elevation dominantly face north. The present vegetation is mainly quaking aspen with an understory of mountain brome, Fendler meadowrue, and mountain snowberry. Elevation is 6,500 to 8,700 feet. The average annual precipitation is about 25 to 35 inches, the mean annual air temperature is 32 to 39 degrees F, and the average freeze-free season is 40 to 70 days.

Typically, the surface is covered with a mat of leaves, twigs, and decayed organic material about 1 inch thick. The surface layer is dark brown gravelly loam about 18 inches thick. The subsurface layer is dark brown very gravelly loam and extremely cobbly loam about 22 inches thick. The subsoil to a depth of 60 inches or more is brown extremely cobbly clay loam.

Included in this unit are about 10 percent Condie gravelly loam, 6 to 25 percent slopes, under conifers; 6 percent Lucky Star gravelly loam, 25 to 60 percent slopes, in the steeper areas; 2 percent Ercan loam, 3 to 15 percent slopes, on north-facing side slopes; and 2 percent Yeljack loam, north, 10 to 30 percent slopes, intermingled throughout the unit.

Permeability of this Lucky Star soil is moderate. Available water capacity is about 5.5 to 7.5 inches. Water supplying capacity is 12 to 19 inches. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is slight.

This unit is woodland, but it is used primarily as rangeland and for wildlife habitat.

This unit is well suited to the production of aspen. The site index for aspen ranges from 68 to 77. The unit can produce about 4,000 cubic feet, or 6,200 board feet (International rule), of merchantable timber per acre from an even-aged, fully stocked stand of trees 100 years old. Roads and landings can be protected from erosion by constructing water bars and by seeding cuts and fills.

The potential understory plant community on this unit is mainly mountain brome, dryland sedges, blue wildrye, and sweetanice.

Practices suitable for use on this unit are proper grazing use and planned grazing systems.

This map unit is in capability unit VIe-HA, nonirrigated, and in woodland suitability group 2f1.

LDF—Lucky Star gravelly loam, 25 to 60 percent slopes. This very deep, well drained soil is on mountainsides along the western boundary of Rich County. It formed in colluvium derived dominantly from conglomerate and sandstone. Slopes are medium to long and are convex or concave. Slopes above an elevation of 7,200 feet face all directions, and those below that elevation dominantly face north. The present vegetation is mainly quaking aspen with an understory of mountain brome, Fendler meadowrue, and mountain snowberry. Elevation is 6,500 to 8,700 feet. The average annual precipitation is about 25 to 35 inches, the mean annual air temperature is 32 to 39 degrees F, and the average freeze-free season is 40 to 70 days.

Typically, the surface is covered with a mat of partially decomposed leaves and twigs about 2 inches thick. The surface layer is dark brown gravelly loam 13 inches thick. The subsurface layer is brown gravelly fine sandy loam 27 inches thick. The subsoil to a depth of 60 inches or more is red very gravelly clay loam and very gravelly sandy clay loam.

Included in this unit are about 10 percent Condie gravelly loam, 25 to 40 percent slopes, under conifers; 8 percent Lucky Star gravelly loam, 8 to 25 percent slopes, in the more gently sloping areas; 4 percent Dagan gravelly loam, moist, 25 to 40 percent slopes, under shrubs and grasses; and 3 percent Ercan loam, 15 to 30 percent slopes, on north-facing side slopes.

Permeability of this Lucky Star soil is moderate. Available water capacity is about 5.5 to 7.5 inches. Water supplying capacity is 11 to 19 inches. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate.

This unit is woodland, but it is used primarily for livestock grazing and wildlife habitat.

This unit is well suited to aspen. The site index ranges from 66 to 77. The soil in this unit can produce about 4,000 cubic feet, or 6,200 board feet (International rule), of merchantable timber per acre from an even-aged, fully stocked stand of trees 100 years old. Minimizing the risk of erosion is essential in harvesting timber. Roads and landings can be protected from erosion by constructing water bars and by seeding cuts and fills.

The potential understory plant community on this unit is mountain brome, dryland sedges, nodding bluegrass, and blue wildrye.

Management practices suitable for use on this unit are proper grazing use and planned grazing systems.

This map unit is in capability unit VIIe-HA, nonirrigated, and in woodland suitability group 2f1.

LEF—Lucky Star-Condie gravelly loams, 25 to 60 percent slopes. This map unit is on mountainsides west of Randolph. Elevation is 7,000 to 8,800 feet. The average annual precipitation is about 25 to 35 inches, the mean annual air temperature is 32 to 38 degrees F, and the average freeze-free season is 40 to 65 days.

This unit is 50 percent Lucky Star gravelly loam and 35 percent Condie gravelly loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are about 8 percent Lucky Star gravelly loam, 8 to 25 percent slopes, in the more gently sloping areas; 5 percent deep, well drained, moderately fine textured soils under conifers; and 2 percent Ercan loam, 15 to 30 percent slopes, that is intermingled throughout areas of this unit and is under aspen.

The Lucky Star soil is very deep and well drained. It formed in colluvium derived dominantly from conglomerate and sandstone. Slopes are medium to long, convex or concave, and dominantly south-facing. The present vegetation is mainly quaking aspen, mountain brome, and blue wildrye.

Typically, the surface is covered with a mat of partially decomposed leaves and twigs about 1 inch thick. The surface layer is dark brown gravelly loam 13 inches thick. The subsurface layer is brown gravelly fine sandy loam 27 inches thick. The subsoil to a depth of 60 inches or more is red very gravelly clay loam and very gravelly sandy clay loam.

Permeability of the Lucky Star soil is moderate. Available water capacity is about 5 to 7 inches. Water supplying capacity is 13 to 19 inches. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate.

The Condie soil is very deep and well drained. It formed in colluvium derived dominantly from conglomerate composed of sandstone and quartzite. Slopes are long, convex or concave, and dominantly face north. The present vegetation is mainly Douglas-fir, lodgepole pine, and snowberry.

Typically, the surface is covered with a mat of partially decomposed leaves and twigs about 1 inch thick. The surface layer is dark brown gravelly loam 5 inches thick. The subsurface layer is brown gravelly sandy loam 15 inches thick. The subsoil is yellowish red very gravelly clay loam 29 inches thick. The substratum to a depth of 60 inches or more is red very gravelly fine sandy loam.

Permeability of the Condie soil is moderately slow. Available water capacity is about 5 to 7 inches. Water supplying capacity is 11 to 14 inches. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate.

This unit is woodland, but it is used primarily for livestock grazing.

The Lucky Star soil is well suited to the production of aspen. Based on a site index of 72, the potential production per acre of merchantable timber is 4,000 cubic feet, or 6,200 board feet (International rule), from an even-aged, fully stocked stand of trees 100 years old. The main concerns in producing and harvesting timber are steepness of slope and minimizing the risk of erosion.

The potential understory plant community on the Lucky Star soil is mountain brome, dryland sedge, blue wildrye, and sweetanice. Practices suitable for use on this soil are proper grazing use and planned grazing systems.

The Condie soil is poorly suited to the production of Douglas-fir and lodgepole pine. Based on a site index of 44, the potential production per acre of merchantable timber is 1,400 cubic feet, or 5,600 board feet (International rule), from an even-aged, fully stocked stand of trees 100 years old.

This map unit is in capability unit VIIe-H, nonirrigated. The Lucky Star soil is in woodland suitability group 2f1, and the Condie soil is in woodland suitability group 6f1.

LFF—Lundy, dry-Rock outcrop complex, 25 to 60 percent slopes. This map unit is on canyon walls and mountainsides, mainly east and south of Laketown and along the northwestern part of the Crawford Mountains. The present vegetation is mainly big sagebrush, lanceleaf yellowbrush, bluebunch wheatgrass, and Utah juniper. Elevation is 6,000 to 7,800 feet. The average annual precipitation is about 12 to 14 inches, the mean annual air temperature is 35 to 42 degrees F, and the average freeze-free season is 55 to 90 days.

This unit is about 70 percent Lundy very gravelly loam, dry, 25 to 60 percent slopes, and 20 percent Rock outcrop. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are about 8 percent Solak very cobbly loam that has slopes of 30 to 60 percent and is on uplands adjacent to canyons and 2 percent Falula very gravelly loam, 4 to 25 percent slopes, in the more gently sloping areas on mountaintops.

The Lundy soil is shallow and somewhat excessively drained. It formed in residuum and colluvium derived dominantly from limestone. Slopes are long and convex or concave. They face south and west. Typically, 40 to 70 percent of the surface is covered with rock fragments. The surface layer is dark brown very gravelly loam about 8 inches thick. Below this is yellowish brown very cobbly loam about 8 inches thick. Fractured limestone is at a depth of 16 inches. Depth to limestone ranges from 10 to 20 inches.

Permeability of the Lundy soil is moderate. Available water capacity is about 1 inch to 2 inches. Water supplying capacity is 2 to 4 inches. Effective rooting depth is 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is high.

Rock outcrop consists of barren areas of exposed limestone. It occurs mainly as ledges and cliffs. Runoff is very rapid.

This unit is used primarily as rangeland and for wildlife habitat. Some areas are also used as woodland.

The potential understory plant community on the Lundy soil is mainly bluebunch wheatgrass, Indian ricegrass, and big sagebrush. The suitability of this soil for rangeland seeding is poor. The main limitations are rock fragments on the surface and the depth to bedrock.

Practices suitable for use on the Lundy soil are proper grazing use and planned grazing systems.

This unit is poorly suited to the production of Utah juniper. It can produce 8.5 cords per acre in a stand of trees that average 5 inches in diameter at a height of 1 foot.

This map unit is in capability unit VIIs-U3J, nonirrigated, and in Upland Shallow Loam (Juniper) range site.

MAA—Matheson sandy loam, wet, 0 to 2 percent slopes. This very deep, somewhat poorly drained soil is on flood plains of the Bear River. It formed in wind-reworked alluvium derived from mixed parent material. Slopes are medium in length and are concave or convex. The present vegetation is mainly broadleaf sedges, foxtail, wiregrass, and hairgrass. Elevation is 6,200 to 6,300 feet. The average precipitation is about 9 to 11 inches, the mean annual air temperature is 38 to 42 degrees F, and the average freeze-free season is 55 to 65 days.

Typically, the surface layer is dark brown sandy loam about 8 inches thick. The subsoil is strong brown sandy loam about 15 inches thick. The upper 15 inches of the substratum is brown sandy loam, and the lower part to a depth of 60 inches or more is brown sand.

Included in this unit are about 3 percent Nevka loam, wet, in the slightly higher lying areas; 2 percent Wader loam; and 2 percent Saleratus loam. The Wader and Saleratus soils are in slightly concave, abandoned stream channels.

Permeability of this Matheson soil is moderately rapid. Available water capacity is about 4 to 5 inches. Effective rooting depth is limited by a water table that is at a depth of 36 to 60 inches. Runoff is slow. This soil is subject to rare periods of flooding.

This unit is used for irrigated hay and pasture and for wildlife habitat.

This unit is well suited to irrigated hay and pasture. Because the soil is droughty late in summer, applications of irrigation water should be light and frequent. If the unit is irrigated, it produces about 5.5 animal-unit-months of forage per acre.

This map unit is in capability unit IVs-4, irrigated.

MBE—Mirror Lake-Sambrito sandy loams, 10 to 30 percent slopes. This map unit is on mountainsides in Spencer Basin. The present vegetation is mainly subalpine fir. Engelmann spruce, Douglas-fir, and some aspen. Elevation is 8,000 to 9,000 feet. The average annual precipitation is about 25 to 30 inches, the mean annual air temperature is 32 to 35 degrees F, and the average freeze-free season is 30 to 40 days.

This unit is 50 percent Mirror Lake sandy loam, 10 to 30 percent slopes, and 35 percent Sambrito sandy loam, 10 to 25 percent slopes. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are about 10 percent Lucky Star soils on stream bottoms and 5 percent Condie gravelly loam, 6 to 25 percent slopes, intermingled throughout the unit.

The Mirror Lake soil is very deep and somewhat excessively drained. It formed in colluvium derived dominantly from sandstone and quartzite. Slopes are long and convex or concave. Typically, the surface is covered with a mat of partially decomposed needles and twigs 1 inch thick. The surface layer is black sandy loam 3 inches thick. The upper 8 inches of the underlying material is dark brown gravelly loamy sand, and the lower part to a depth of 60 inches or more is light yellowish brown very gravelly sand and yellowish red very cobbly sand.

Permeability of the Mirror Lake soil is rapid. Available water capacity is 2.0 to 2.5 inches. Water supplying capacity is 6 to 8 inches. Effective rooting depth is 60 inches or more. Runoff is slow to medium, and the hazard of water erosion is moderate.

The Sambrito soil is very deep and well drained. It formed in colluvium derived dominantly from sandstone. Slopes are long and convex or concave. Typically, the surface is covered with a mat of partially decomposed needles and twigs about 1 inch thick. The surface layer is very dark brown sandy loam 4 inches thick. The subsoil is brown fine sandy loam 8 inches thick. The upper 8 inches of the substratum is brown fine sandy loam, and the lower part to a depth of 60 inches or more is yellowish red gravelly sandy loam.

Permeability of the Sambrito soil is moderately rapid. Available water capacity is about 4 to 5 inches. Water supplying capacity is 12 to 14 inches. Effective rooting depth is 60 inches or more. Runoff is rapid, and the hazard of water erosion is moderate.

This unit is used as woodland and for wildlife habitat.

Management practices and capability classification are not provided for this unit (all in National Forest).

MCD—Mult-Agassiz complex, 10 to 25 percent slopes. This map unit is on mountainsides along the Rich County line, west of Randolph. Elevation is 7,800 to 8,700 feet. The average annual precipitation is about 18 to 25 inches, the mean annual air temperature is 31 to 36 degrees F, and the average freeze-free season is 30 to 55 days.

This unit is 55 percent Mult loam and 30 percent Agassiz very stony loam. The Mult soil is dominantly on northeast- and north-facing side slopes, and the Agassiz soil is dominantly on south- and southeast-facing side slopes and on ridgetops. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are about 10 percent deep, well drained soils that are fine textured and 5 percent deep, well drained soils that are moderately fine textured. These soils are on northeast-facing side slopes.

The Mult soil is moderately deep and well drained. It formed in residuum and colluvium derived dominantly from limestone. Slopes are long and convex or concave. They face dominantly northeast and north. The present vegetation is mainly subalpine fir, Douglas-fir, and Engelmann spruce.

Typically, the surface of the Mult soil is covered with a mat of partially decomposed needles and twigs 1 inch thick. The surface layer is dark brown loam 10 inches thick. The subsoil is brown clay loam 28 inches thick. Limestone is at a depth of 38 inches. Depth to limestone ranges from 20 to 40 inches.

Permeability of the Mult soil is moderately slow. Available water capacity is about 5.5 to 7.0 inches. Water supplying capacity is 10 to 14 inches. Effective rooting depth is 20 to 40 inches. Runoff is medium, and the hazard of water erosion is moderate.

The Agassiz soil is shallow and somewhat excessively drained. It formed in residuum derived dominantly from limestone. Slopes are medium to long and are convex. They dominantly face southeast and south. The present vegetation is mainly bluebunch wheatgrass, antelope bitterbrush, curlleaf mountainmahogany, and muttongrass.

Typically, the surface layer of the Agassiz soil is dark brown very stony loam 5 inches thick. The underlying material is dark brown very cobbly loam 7 inches thick. Limestone is at a depth of 12 inches. Depth to limestone ranges from 10 to 20 inches.

Permeability of the Agassiz soil is moderate. Available water capacity is about 1 inch to 2 inches. Water supplying capacity is 3 to 6 inches. Effective rooting depth is 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is moderate.

The unit is used mainly for livestock grazing and wildlife habitat.

The Mult soil in this unit is woodland, and the Agassiz soil is rangeland.

Management practices and capability classification are not provided for this unit (all in National Forest).

MDC—Murphy-Richville, dry complex, 4 to 8 percent slopes. This map unit is on gently rolling and rolling uplands in the southern part of Rich County.

Slopes are long and slightly convex. Elevation is 6,700 to 7,300 feet. The average annual precipitation is about 12 to 15 inches, the mean annual air temperature is 36 to 38 degrees F, and the average freeze-free season is 55 to 65 days.

This unit is 50 percent Murphy clay loam and 30 percent Richville loam, dry. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are about 9 percent Kearl sandy loam that has slopes of 4 to 15 percent and is on convex ridgetops; 5 percent Zegro silty clay loam, 2 to 5 percent slopes, intermingled throughout the unit; 3 percent fine textured soils overlying shale; and 2 percent Rock outcrop occurring as steep ledges. Also included are small areas of Lariat fine sandy loam, 4 to 10 percent slopes. Included areas make up about 20 percent of the total acreage.

The Murphy soil is very deep and well drained. It formed in colluvium derived dominantly from shale. The present vegetation is mainly low sagebrush, Nevada bluegrass, western wheatgrass, and lanceleaf yellowbrush. Typically, the surface layer is dark reddish brown clay loam 4 inches thick. The subsoil is dark reddish brown silty clay loam 7 inches thick. The substratum to a depth of 60 inches or more is dark reddish brown silty clay loam.

Permeability of the Murphy soil is slow. Available water capacity is about 10 to 11 inches. Water supplying capacity is 9 to 11.5 inches. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate.

The Richville soil is moderately deep and well drained. It formed in residuum derived dominantly from sandstone and siltstone. The present vegetation is mainly big sagebrush, Nevada bluegrass, lanceleaf yellowbrush, and owl clover. Typically, the surface layer is dark brown loam 3 inches thick. The subsoil is dark brown clay loam 7 inches thick. The substratum is yellowish red clay loam 14 inches thick. Weathered sandstone is at a depth of 24 inches. Depth to sandstone ranges from 20 to 40 inches.

Permeability of the Richville soil is moderately slow. Available water capacity is about 4.0 to 5.5 inches. Water supplying capacity is 6 to 9 inches. Effective rooting depth is 20 to 40 inches. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used as rangeland and for wildlife habitat.

The potential plant community on the Murphy soil is mainly antelope bitterbrush, Indian ricegrass, big sagebrush, and Nevada bluegrass. The suitability of this soil for rangeland seeding is good.

The potential plant community on the Richville soil is mainly big sagebrush, muttongrass, bluebunch wheatgrass, and Nevada bluegrass. The suitability of this soil for rangeland seeding is fair. The main limitations are the low available water capacity and depth to bedrock.

Practices suitable for use on the soils in this unit are proper grazing use and planned grazing systems. Shrubs can be controlled by chemical treatment, mechanical treatment, or prescribed burning.

This map unit is in capability unit VIe-U3, nonirrigated, and in Upland Loam range site.

MDE—Murphy-Richville, dry complex, 15 to 30 percent slopes. This map unit is on hilly and steeply sloping uplands in the southern part of Rich County. Slopes are medium to long and are slightly convex. Elevation is 6,700 to 7,300 feet. The average annual precipitation is about 12 to 15 inches, the mean annual air temperature is 36 to 38 degrees F, and the average freeze-free season is 55 to 65 days.

This unit is 60 percent Murphy clay loam and 30 percent Richville loam, dry. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are about 5 percent shallow, fine textured soils that are underlain by red shale and are intermingled throughout the unit; 3 percent Rock outcrop occurring as ledges and dominantly near the top of slopes; and 2 percent Dennot loam, 25 to 40 percent slopes, on north-facing side slopes.

The Murphy soil is very deep and well drained. It formed in colluvium derived dominantly from shale. The present vegetation is mainly low sagebrush, Nevada bluegrass, lanceleaf yellowbrush, and owl clover. Typically, the surface layer is dark brown clay loam 10 inches thick. The subsoil is reddish brown clay loam 6 inches thick. The substratum to a depth of 60 inches or more is yellowish red clay loam.

Permeability of the Murphy soil is slow. Available water capacity is about 10 to 11 inches. Water supplying capacity is 9.0 to 11.5 inches. Effective rooting depth is 60 inches or more. Runoff is rapid, and the hazard of water erosion is high.

The Richville soil is moderately deep and well drained. It formed in residuum and colluvium derived dominantly from sandstone and siltstone. The present vegetation is mainly big sagebrush, Nevada bluegrass, lanceleaf yellowbrush, and owl clover. Typically, the surface layer is dark brown loam 3 inches thick. The subsoil is dark brown clay loam 7 inches thick. The substratum is yellowish red clay loam 14 inches thick. Weathered sandstone is at a depth of 24 inches. Depth to sandstone ranges from 20 to 40 inches.

Permeability of the Richville soil is moderately slow. Available water capacity is about 4.0 to 5.5 inches. Water supplying capacity is 6 to 9 inches. Effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high.

This unit is used as rangeland and for wildlife habitat.

The potential plant community on the Murphy soil is mainly antelope bitterbrush, Indian ricegrass, big sagebrush, and Nevada bluegrass. The suitability of this

soil for rangeland seeding is fair. The main limitation is slope.

The potential plant community on the Richville soil is mainly big sagebrush, muttongrass, bluebunch wheatgrass, and Nevada bluegrass. The suitability of this soil for rangeland seeding is fair. The main limitations are slope, low available water capacity, and depth to bedrock.

Practices suitable for use on the soils in this unit are proper grazing use and planned grazing systems. Shrubs can be controlled by chemical treatment, mechanical treatment, or prescribed burning.

This map unit is in capability unit VIe-U3, nonirrigated, and in Upland Loam range site.

NAD—Neponset sandy loam, 6 to 10 percent slopes. This moderately deep, well drained soil is on rolling uplands southeast of Neponset Reservoir. It formed mainly in residuum derived dominantly from sandstone and siltstone. Slopes are long and concave or convex. They face north, south, and west. The present vegetation is mainly big sagebrush, Nevada bluegrass, western wheatgrass, and lanceleaf yellowbrush. Elevation is 6,400 to 6,700 feet. The average annual precipitation is about 9 to 12 inches, the mean annual air temperature is 38 to 42 degrees F, and the average freeze-free season is 60 to 80 days.

Typically, the surface layer is reddish brown sandy loam about 6 inches thick. The underlying material is light red silt loam about 24 inches thick. Weathered siltstone is at a depth of about 30 inches. Depth to sandstone ranges from 20 to 40 inches.

Included in this unit are about 6 percent Lariat fine sandy loam, 4 to 10 percent slopes, near the top of slopes; 4 percent Alhark loam, 6 to 15 percent slopes, commonly on northeast-facing side slopes; 3 percent Pancheri silt loam, cool, 5 to 10 percent slopes, intermingled throughout the unit; and 2 percent Zegro silty clay loam, 2 to 5 percent slopes, in concave areas.

Permeability of this Neponset soil is moderate. Available water capacity is about 3.5 to 5.0 inches. Water supplying capacity is 4.5 to 7.0 inches. Effective rooting depth is 20 to 40 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high.

This unit is used as rangeland and for wildlife habitat.

The potential plant community on this unit is mainly bluebunch wheatgrass, needleandthread, big sagebrush, and bottlebrush squirreltail. The suitability of the unit for rangeland seeding is fair. The main limitations are low precipitation, low available water capacity, depth to bedrock, and the sandy loam surface layer.

Management practices suitable for use on this unit are proper grazing use and planned grazing systems. Shrubs can be controlled by chemical treatment, mechanical treatment, or prescribed burning.

This map unit is in capability unit VIs-S, nonirrigated, and in Semidesert Loam range site.

NBA—Nevka loam. This very deep, poorly drained soil is on flood plains around Bear Lake and on the Bear River flood plain. It formed in alluvium derived from mixed parent material. Slopes are 0 to 1 percent and are long. The native vegetation is mainly saltgrass, basin wildrye, alkali sacaton, and greasewood. Elevation is 5,930 to 6,430 feet. The average annual precipitation is about 9 to 14 inches, the mean annual air temperature is 38 to 44 degrees F, and the average frost-free season is 55 to 90 days.

Typically, the surface layer is brown loam about 4 inches thick. The upper 34 inches of the underlying material is light brown and light yellowish brown loam, and the lower part to a depth of 60 inches or more is brown sand.

Included in this unit are about 9 percent Nevka loam, wet, in slightly concave areas; 4 percent Bear Lake silty clay loam, saline-alkali, intermingled throughout the unit; and 2 percent Bear Lake silt loam in slightly concave areas.

Permeability of this Nevka soil is moderate. Available water capacity is about 5.0 to 6.5 inches. Effective rooting depth is limited by a seasonal high water table that is at a depth of 24 to 36 inches from May to July. Runoff is slow, and the hazard of water erosion is slight. This soil is subject to rare periods of flooding.

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

This unit is poorly suited to irrigated hay and pasture. The concentration of salts and alkali in the surface layer limits the production of plants suitable for hay and pasture. Leaching of the salts is limited by the high water table; however, drainage and irrigation water management reduce the concentration of salts. Salt-tolerant species are most suitable for planting.

The potential plant community on this unit is mainly saltgrass, alkali sacaton, alkali bluegrass, and basin wildrye. The suitability of the unit for rangeland seeding is poor. The main limitation is the content of salts and alkali in the soil. Practices suitable for use on this unit are proper grazing use and planned grazing systems.

If this unit is used for homesite development, the main limitations are the high water table and the hazard of flooding. The high water table increases the possibility of failure of septic tank absorption fields.

This map unit is in capability unit VIIw-8, irrigated. It is in the Alkali Bottoms range site.

NCA—Nevka loam, wet. This very deep, poorly drained soil is mainly on flood plains around Bear Lake and on the Bear River flood plain. It formed in alluvium derived from mixed parent material. Slopes are 0 to 1 percent. They are long and slightly convex or concave.

The present vegetation is mainly broadleaf sedges, wiregrass, and foxtail. Elevation is 5,930 to 6,430 feet. The average annual precipitation is about 9 to 14 inches, the mean annual air temperature is 38 to 44 degrees F, and the average frost-free season is 55 to 90 days.

Typically, the surface layer is brown loam about 8 inches thick. The upper 24 inches of the underlying material is very pale brown and light yellowish brown loam, and the lower part to a depth of 60 inches or more is pale brown fine sand and sand.

Included in this unit are about 7 percent Bear Lake silt loam in shallow depressional areas; 5 percent Saleratus loam near stream channels; 1 percent Thatcher silt loam, warm, 1 to 3 percent slopes, on alluvial fans; and 2 percent Nevka loam in slightly convex areas of flood plains.

Permeability of this Nevka soil is moderate. Available water capacity is about 5.5 to 7.5 inches. Effective rooting depth is limited by a seasonal high water table that is at a depth of 18 to 36 inches from May to July. Runoff is very slow. This soil is subject to rare periods of flooding.

This unit is used mainly for irrigated hay and pasture. It is also used as homesites and for wildlife habitat.

This unit is well suited to irrigated hay and pasture. Wetness limits the choice of plants and the period of cutting or grazing and increases the risk of winterkill. If drainage is not provided, plants that tolerate a seasonal high water table should be selected. If this unit is irrigated, it produces about 6 animal-unit-months of forage per acre.

If this unit is used for homesite development, the main limitations are the high water table and the hazard of flooding. The high water table increases the possibility of failure of septic tank absorption fields.

This map unit is in capability unit Vw-4, irrigated.

PAC—Pancheri silt loam, cool, 1 to 5 percent slopes. This very deep, well drained soil is on foothills south and west of the Bear River flood plain. It formed in loess deposits derived from mixed parent material. Slopes are long and convex or concave. The present vegetation is mainly big sagebrush, lanceleaf yellowbrush, phlox, bluebunch wheatgrass, and Nuttall saltbush. Elevation is 6,200 to 6,600 feet. The average annual precipitation is about 9 to 11 inches, the mean annual air temperature is 38 to 42 degrees F, and the average freeze-free season is 55 to 70 days.

Typically, the surface layer is yellowish brown silt loam about 9 inches thick. The subsoil is yellowish brown silt loam about 6 inches thick. The substratum to a depth of 60 inches or more is light brown silt loam. A layer of carbonate accumulation is at a depth of about 15 inches.

Included in this unit are about 5 percent Pancheri silt loam, cool, 5 to 10 percent slopes, in the more rolling areas; 5 percent Woodpass loam, 2 to 8 percent slopes, intermingled throughout the unit; 3 percent Duckree gravelly silt loam, 15 to 40 percent slopes, in the steeper areas; and 2 percent Bockston loam, cool, 0 to 3 percent slopes, on alluvial fans and stream terraces.

Permeability of this Pancheri soil is moderate. Available water capacity is about 10 to 11 inches. Water supplying capacity is 6 to 9 inches. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is high.

This unit is used mainly as rangeland and for wildlife habitat. Some areas are used for irrigated crops and homesite development.

The potential plant community on this unit is mainly bluebunch wheatgrass, needleandthread, big sagebrush, and bottlebrush squirreltail. The suitability of the unit for rangeland seeding is fair. The main limitation is low precipitation.

Practices suitable for use on this unit are proper grazing use and planned grazing systems. Shrubs can be controlled by chemical treatment, mechanical treatment, or prescribed burning.

This unit is well suited to irrigated alfalfa and small grain. Crop residue left on or near the surface helps to conserve moisture, maintain tilth, and control erosion. Tillage should be kept to a minimum. If this unit is irrigated, it produces about 4 tons of alfalfa per acre and about 80 bushels of barley per acre.

This unit is well suited to homesite development. In summer, irrigation is needed for lawn grasses, shrubs, vines, shade trees, and ornamental trees.

This map unit is in capability units IVe-4, irrigated, and VIe-S, nonirrigated. It is in the Semidesert Loam range site.

PAD—Pancheri silt loam, cool, 5 to 10 percent slopes. This very deep, well drained soil is on foothills south and west of the Bear River flood plain. It formed in loess deposits derived from mixed parent material. Slopes are long and convex or concave. The present vegetation is mainly big sagebrush, lanceleaf yellowbrush, phlox, bluebunch wheatgrass, and Nuttall saltbush. Elevation is 6,200 to 6,700 feet. The average annual precipitation is about 9 to 12 inches, the mean annual air temperature is 38 to 42 degrees F, and the average freeze-free season is 55 to 70 days.

Typically, the surface layer is yellowish brown silt loam about 6 inches thick. The subsoil is brown silt loam about 16 inches thick. The substratum to a depth of 60 inches or more is light brown silt loam. A layer of carbonate accumulation is at a depth of about 22 inches.

Included in this unit are about 5 percent Duckree gravelly silt loam, 15 to 40 percent slopes, in the steeper areas; 4 percent Pancheri silt loam, cool, 1 to 5 percent slopes, in gently undulating areas; 4 percent Woodpass loam, 2 to 8 percent slopes; and 2 percent Alhark loam, 6 to 15 percent slopes. The Woodpass and Alhark soils are intermingled throughout the unit.

Permeability of this Pancheri soil is moderate. Available water capacity is about 10 to 11 inches. Water supplying capacity is 6 to 9 inches. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is high.

This unit is used mainly as rangeland and for wildlife habitat. Some areas are used for irrigated crops and homesite development.

The potential plant community on this unit is mainly bluebunch wheatgrass, needleandthread, big sagebrush, and bottlebrush squirreltail. The suitability of the unit for rangeland seeding is fair. The main limitations are low precipitation and slope.

Practices suitable for use on this unit are proper grazing use and planned grazing systems. Shrubs can be controlled by chemical treatment, mechanical treatment, or prescribed burning.

This unit is well suited to irrigated alfalfa and small grain. Seedbed preparation should be on the contour or across the slope where practical. Tilth and fertility can be improved by returning crop residue to the soil. Tillage should be kept to a minimum. Sprinklers should be used to irrigate the unit. If this unit is irrigated, it produces about 4 tons of alfalfa per acre and 75 bushels of barley per acre.

This unit is well suited to homesite development. It is limited mainly by areas that have slopes of more than 8 percent. In summer, irrigation is needed for lawn grasses, shrubs, vines, shade trees, and ornamental trees.

This map unit is in capability units IVe-4, irrigated, and VIe-S, nonirrigated. It is in the Semidesert Loam range site.

PAE—Pancheri silt loam, cool, 10 to 25 percent slopes. This very deep, well drained soil is on foothills west and south of the Bear River flood plain. It formed in loess deposits derived from mixed parent material. Slopes are long and convex or concave. The present vegetation is mainly big sagebrush, needleandthread, lanceleaf yellowbrush, Sandberg bluegrass, and bluebunch wheatgrass. Elevation is 6,200 to 6,600 feet. The average annual precipitation is about 9 to 12 inches, the mean annual air temperature is 38 to 42 degrees F, and the average freeze-free season is 55 to 70 days.

Typically, the surface layer is yellowish brown silt loam about 6 inches thick. The subsoil is yellowish brown silt loam about 11 inches thick. The substratum to a depth of 60 inches or more is light brown and very pale brown silt loam. A layer of carbonate accumulation is at a depth of about 17 inches.

Included in this unit are about 6 percent Duckree gravelly silt loam, 15 to 40 percent slopes, on ridges and 4 percent Pancheri silt loam, cool, 5 to 10 percent slopes, on rolling foothills and toe slopes.

Permeability of this Pancheri soil is moderate. Available water capacity is about 10 to 11 inches. Water supplying capacity is 6 to 9 inches. Effective rooting depth is 60 inches or more. Runoff is moderate, and the hazard of water erosion is high.

This unit is used mainly as rangeland and for wildlife habitat.

The potential plant community on this unit is mainly bluebunch wheatgrass, needleandthread, big sagebrush, and bottlebrush squirreltail. The suitability of the unit for rangeland seeding is fair. The main limitations are slope and low precipitation.

Practices suitable for use on this unit are proper grazing use and planned grazing systems. Shrubs can be controlled by chemical treatment, mechanical treatment, or prescribed burning. If the plant cover is disturbed, practices are needed to control gullying and sheet erosion.

This map unit is in capability unit VIe-S, nonirrigated. It is in the Semidesert Loam range site.

PAE2—Pancheri silt loam, cool, 10 to 20 percent slopes, eroded. This very deep, well drained soil is on foothills. It is mainly west of the Bear River flood plain, extending from Woodruff north to the Wyoming border. The soil formed in loess deposits derived from mixed parent material. Slopes are medium in length and are convex or concave. They dominantly face south. The present vegetation is mainly lanceleaf yellowbrush, black sagebrush, big sagebrush, Indian ricegrass, saltbush, and phlox. Elevation is 6,200 to 6,700 feet. The average annual precipitation is about 9 to 12 inches, the mean annual air temperature is 38 to 42 degrees F, and the average freeze-free season is 55 to 70 days.

Typically, 40 to 50 percent of the surface layer has been lost through erosion. The surface layer is pale brown silt loam about 4 inches thick. The subsoil is light yellowish brown silt loam about 11 inches thick. The substratum to a depth of 60 inches or more is light gray and light yellowish brown silt loam. A layer of carbonate accumulation is at a depth of 15 inches. *V*-shaped gullies are common and are from 9 to 24 inches deep.

Included in this unit are about 6 percent Duckree gravelly silt loam, 15 to 40 percent slopes, in the steeper areas; 6 percent Pancheri silt loam, cool, 10 to 20 percent slopes, on north- and east-facing side slopes; 5 percent soils, intermingled throughout the unit, that are similar to this Pancheri soil but are 15 to 25 percent gravel in the surface layer and subsoil; and 3 percent Bereniceton gravelly loam, cool, 15 to 25 percent slopes, in the steeper areas.

Permeability of this Pancheri soil is moderate. Available water capacity is about 10 to 11 inches. Water supplying capacity is 6 to 9 inches. Effective rooting depth is 60 inches or more. Runoff is rapid, and the hazard of water erosion is high.

This unit is used as rangeland and for wildlife habitat.

The potential plant community on this unit is mainly bluebunch wheatgrass, needleandthread, big sagebrush,

and bottlebrush squirreltail. The suitability of the unit for rangeland seeding is fair. The main limitations are low precipitation and slope.

Practices suitable for use on this unit are proper grazing use and planned grazing systems. Shrubs can be controlled by chemical treatment, mechanical treatment, or prescribed burning. If the plant cover is disturbed, practices are needed to control gullying and sheet erosion.

This map unit is in capability unit VIe-SE, nonirrigated, and in Semidesert Loam range site.

PBF—Pancheri-Highams Variant-Rock outcrop complex, 6 to 50 percent slopes. This map unit is on mountainsides and ridges in the northern half of the Crawford Mountains. The present vegetation is mainly black sagebrush, bluebunch wheatgrass, big sagebrush, and shadscale. Elevation is 6,750 to 7,600 feet. The average annual precipitation is about 10 to 12 inches, the mean annual air temperature is 36 to 40 degrees F, and the average freeze-free season is 50 to 75 days.

This unit is 40 percent Pancheri silt loam, 30 to 50 percent slopes; 30 percent Highams Variant gravelly loam, 6 to 50 percent slopes; and 10 percent Rock outcrop. The Pancheri soil is on mountainsides, the Highams Variant soil is on ridges, and Rock outcrop is on very steep side slopes and ridgetops. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are about 6 percent Rexmont gravelly loam that has slopes of 25 to 70 percent and is on ridgetops; 6 percent Fontreen gravelly silt loam that has slopes of 10 to 40 percent and is on north-facing side slopes; 5 percent Pancheri silt loam, cool, 10 to 20 percent slopes, on toe slopes; and 3 percent Rexmont gravelly loam that has slopes of 6 to 20 percent and is on ridgetops. Also included are small areas of Pancheri silt loam, cool, 5 to 10 percent slopes, on toe slopes and small areas of Pits and Dumps. Included areas make up about 20 percent of the total acreage.

The Pancheri soil is very deep and well drained. It formed in loess derived from mixed parent material. Slopes are long and convex or concave. They face east and west. Typically, the surface layer is yellowish brown silt loam 7 inches thick. The subsoil is light gray silt loam 11 inches thick. The substratum to a depth of 60 inches or more is pale brown silt loam. A layer of carbonate accumulation is at a depth of 18 inches.

Permeability of the Pancheri soil is moderate. Available water capacity is about 10 to 11 inches. Water supplying capacity is 6 to 9 inches. Effective rooting depth is 60 inches or more. Runoff is rapid, and the hazard of water erosion is high.

The Highams Variant soil is shallow and somewhat excessively drained. It formed in residuum derived dominantly from limestone. Slopes are medium to long and are convex. They face east, south, and west. Typically, 60 to 90 percent of the surface is covered with rock fragments. The soil is brown gravelly loam 13 inches deep over limestone. Depth to limestone ranges from 10 to 20 inches.

Permeability of the Highams Variant soil is moderate. Available water capacity is about 1.5 to 2.5 inches. Water supplying capacity is 2 to 4 inches. Effective rooting depth is 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is moderate.

Rock outcrop consists of areas of exposed limestone. It occurs mainly as ledges and cliffs. Runoff is very rapid.

This unit is used as rangeland and for wildlife habitat.

The potential plant community on the Pancheri soil is mainly bluebunch wheatgrass, needleandthread, big sagebrush, and bottlebrush squirreltail. The potential plant community on the Highams Variant soil is mainly bluebunch wheatgrass, winterfat, black sagebrush, and Indian ricegrass. The suitability of this unit for rangeland seeding is very poor. The main limitations are the slope of the Pancheri soil and the depth to rock and low available water capacity of the Highams Variant soil.

Management practices that maintain or improve the range vegetation include proper grazing use, planned grazing systems, fencing, and stock water development. Shrubs can be controlled by chemical treatment.

This map unit is in capability unit VIIs-SE, nonirrigated. The Pancheri soil is in Semidesert Loam range site, and the Highams Variant soil is in Semidesert Shallow Loam range site.

PD—Pits-Dumps complex. This unit consists of open excavations from which soil and the underlying material have been removed and areas where waste rock and refuse have accumulated. These areas support little if any vegetation.

Onsite investigation is needed on this unit to determine use and management. Smoothing, adding topsoil of finer textured material, and seeding can be used to establish vegetation in some areas of Dumps.

This unit is not assigned a capability classification.

RAD—Ramshorn gravelly loam, 8 to 15 percent slopes. This very deep, somewhat excessively drained soil is on toe slopes along the western part of the Crawford Mountains. It formed alluvium and colluvium derived dominantly from limestone. Slopes are long and convex. They dominantly face east. The present vegetation is mainly Sandberg bluegrass, low sagebrush, Indian ricegrass, and needleandthread. Elevation is 6,200 to 6,500 feet. The average annual precipitation is about 10 to 12 inches, the mean annual air temperature is 38 to 40 degrees F, and the average freeze-free season is 70 to 90 days.

Typically, the surface layer is brown gravelly loam about 3 inches thick. The underlying material to a depth

of 60 inches or more is pale brown extremely gravelly sandy loam.

Included in this unit are about 3 percent Alhark silt loam, loamy substratum, 4 to 10 percent slopes, on old stream terraces and 2 percent Lundy very gravelly loam that is dry, has slopes of 25 to 60 percent, and is on ridgetops.

Permeability of this Ramshorn soil is moderately rapid. Available water capacity is about 4.0 to 5.5 inches. Water supplying capacity is 5.5 to 7.5 inches. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used as rangeland and for wildlife habitat.

The potential plant community on this unit is mainly bluebunch wheatgrass, needleandthread, big sagebrush, and bottlebrush squirreltail. The suitability of the unit for rangeland seeding is poor. The main limitation is rock fragments in the surface layer.

Management practices suitable for use on this unit are proper grazing use and planned grazing systems. Shrubs can be controlled by chemical treatment, mechanical treatment, or prescribed burning.

This map unit is in capability unit VIIe-S4, nonirrigated, and in Semidesert Stony Loam range site.

RBD—Ramshorn Variant-Highams complex, 2 to 15 percent slopes. This map unit is on foothills along Otter Creek, northwest of Randolph. The present vegetation is mainly black sagebrush, phlox, lanceleaf yellowbrush, Sandberg bluegrass, and rock goldenrod. Elevation is 6,600 to 7,000 feet. The average annual precipitation is about 12 to 14 inches, the mean annual air temperature is 40 to 43 degrees F, and the average freeze-free season is 60 to 80 days.

This unit is 50 percent Ramshorn Variant gravelly loam and 30 percent Highams loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are about 7 percent Falula very gravelly loam, 4 to 25 percent slopes, on the tops of low ridges; 7 percent Kearl loam, 4 to 15 percent slopes, at the higher elevations in the unit; 5 percent Despain gravelly loam, 30 to 60 percent slopes, on north-facing side slopes; and 1 percent Vanni loam, 10 to 30 percent slopes, intermingled throughout the unit.

The Ramshorn Variant soil is moderately deep and well drained. It formed in residuum derived dominantly from limestone. Slopes are medium to long and are convex or concave. They face east, south, and west. Typically, the surface layer is light brownish gray gravelly loam 10 inches thick. The next layer is white very gravelly loam and extremely gravelly loam 25 inches thick. Limestone is at a depth of 35 inches. Depth to limestone ranges from 20 to 40 inches.

Permeability of the Ramshorn Variant soil is moderately rapid. Available water capacity is about 2.0 to 3.5 inches. Water supplying capacity is 4 to 7 inches. Effective rooting depth is 20 to 40 inches. Runoff is medium, and the hazard of water erosion is moderate.

The Highams soil is shallow and somewhat excessively drained. It formed in residuum derived dominantly from limestone. Slopes are medium to long and are convex or concave. They face south, east, and west. Typically, the surface layer is grayish brown loam 5 inches thick. The upper 7 inches of the underlying material is brown very gravelly loam, and the lower 5 inches is white extremely gravelly loam. Limestone is at a depth of 17 inches. Depth to limestone ranges from 10 to 20 inches.

Permeability of the Highams soil is moderate. Available water capacity is about 2 to 3 inches. Water supplying capacity is 3 to 4 inches. Effective rooting depth is 10 to 20 inches. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used as rangeland.

The potential plant community on the Ramshorn Variant soil is mainly bluebunch wheatgrass, black sagebrush, muttongrass, and antelope bitterbrush. The potential plant community on the Highams soil is mainly bluebunch wheatgrass, big sagebrush, black sagebrush, and Sandberg bluegrass. The suitability of this unit for rangeland seeding is poor. The main limitations are low available water capacity, depth to bedrock, and slope.

Management practices that maintain or improve the range vegetation include proper grazing use, planned grazing systems, fencing, and stock water developments. Shrubs can be controlled by chemical treatment, mechanical treatment, or prescribed burning.

This map unit is in capability unit VIIs-S3, nonirrigated. The Ramshorn Variant soil is in Upland Stony Loam range site, and the Highams soil is in Upland Shallow Loam range site.

RBE—Ramshorn Variant-Highams complex, 15 to 40 percent slopes. This map unit is on foothills and stream-cut valley sides along Otter Creek, northwest of Randolph. The present vegetation is mainly black sagebrush, phlox, rock goldenrod, antelope bitterbrush, and Sandberg bluegrass. Elevation is 6,500 to 7,000 feet. The average annual precipitation is about 12 to 14 inches, the mean annual air temperature is 40 to 43 degrees F, and the average freeze-free season is 60 to 80 days.

This unit is 50 percent Ramshorn Variant gravelly loam and 30 percent Highams loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are about 8 percent Despain gravelly loam, 30 to 60 percent slopes, on north-facing side slopes; 7 percent Solak gravelly loam, 10 to 50 percent slopes, on ridges; and 5 percent Duckree gravelly silt loam, 15 to 40 percent slopes, on south-facing side slopes.

The Ramshorn Variant soil is moderately deep and well drained. It formed in residuum and colluvium derived dominantly from limestone. Slopes are medium to long and are concave. They face south, east, and west. Typically, the surface layer is very pale brown gravelly loam about 3 inches thick. The next layer is white extremely gravelly loam about 27 inches thick. Limestone is at a depth of 30 inches. Depth to bedrock ranges from 20 to 40 inches.

Permeability of the Ramshorn Variant soil is moderately rapid. Available water capacity is about 2 to 3 inches. Water supplying capacity is 4 to 6 inches. Effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high.

The Highams soil is shallow and somewhat excessively drained. It formed in residuum and colluvium derived dominantly from limestone. Slopes are medium to long and are convex. They face south, east, and west. Typically, the surface layer is light yellowish brown loam about 6 inches thick. The next layer is pale brown extremely gravelly loam about 8 inches thick. Limestone is at a depth of 14 inches. Depth to bedrock ranges from 10 to 20 inches.

Permeability of the Highams soil is moderate. Available water capacity is about 1 inch to 2 inches. Water supplying capacity is 3 to 4 inches. Effective rooting depth is 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is high.

This unit is used as rangeland and for wildlife habitat.

The potential plant community on the Ramshorn Variant soil is mainly bluebunch wheatgrass, black sagebrush, muttongrass, and antelope bitterbrush. The potential plant community on the Highams soil is mainly bluebunch wheatgrass, big sagebrush, black sagebrush, and Sandberg bluegrass. The suitability of this unit for rangeland seeding is poor. The main limitations are low available water capacity, depth to bedrock, and slope.

Management practices that maintain or improve the range vegetation include proper grazing use, planned grazing systems, fencing, and stock water developments. Shrubs can be controlled by chemical treatment.

This map unit is in capability unit VIIs-S3. The Ramshorn Variant soil is in Upland Stony Loam range site, and the Highams soil is in Upland Shallow Loam range site.

RCG—Rexmont-Rock outcrop complex, 25 to 70 percent slopes. This map unit is on mountainsides and ridgetops in the central part of the Crawford Mountains, east of Randolph. Slopes are long and convex. They face south and west. The present vegetation is mainly Utah juniper, bluebunch wheatgrass, big sagebrush, and black sagebrush. Elevation is 6,750 to 7,750 feet. The average annual precipitation is about 10 to 13 inches, the mean annual air temperature is 37 to 39 degrees F, and the average freeze-free season is 50 to 65 days.

This unit is 70 percent Rexmont gravelly loam, 25 to 70 percent slopes, and 20 percent Rock outcrop. Rock outcrop is scattered throughout the unit.

Included in this unit are about 2 percent Rexmont gravelly loam, on ridgetops, that has slopes of 6 to 20 percent; 2 percent Fontreen gravelly silt loam that is on north- and east-facing side slopes of 10 to 40 percent; and 2 percent Highams Variant gravelly loam, on nearly barren ridges, that has slopes of 6 to 50 percent. Also included are small areas of Pancheri silt loam, cool, 10 to 20 percent slopes, on gently sloping toe slopes.

The Rexmont soil is shallow and somewhat excessively drained. It formed in residuum derived dominantly from limestone. Typically, the surface layer is brown gravelly loam 8 inches thick. The next layer is brown very cobbly loam 7 inches thick. Limestone is at a depth of 15 inches. Depth to limestone ranges from 10 to 20 inches.

Permeability of the Rexmont soil is moderate. Available water capacity is about 1 inch to 2 inches. Water supplying capacity is 3 to 4 inches. Effective rooting depth is 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is high.

Rock outcrop consists of areas of exposed limestone. It occurs mainly as ledges and cliffs. Runoff is very rapid.

This unit is used as woodland, for wildlife habitat, and as rangeland.

The potential plant community on the Rexmont soil in this unit is Utah juniper with an understory of bluebunch wheatgrass, Indian ricegrass, and big sagebrush. The soil is poorly suited to rangeland seeding. Management practices that maintain or improve the range vegetation include proper grazing use, planned grazing systems, fencing, and stock water developments.

The Rexmont soil is poorly suited to the production of Utah juniper. It can produce 8.5 cords per acre in a stand of trees that average 5 inches in diameter at a height of 1 foot.

This map unit is in capability unit VIIs-S3J, nonirrigated, and in woodland suitability group 3d5.

RD—Rich loam, wet. This very deep, somewhat poorly drained soil is on flood plains of the Bear River. It formed in alluvium derived from mixed parent material. Slopes are 0 to 1 percent. They are long and undulating. The present vegetation is mainly broadleaf sedges, saltgrass, foxtail, hairgrass, and wiregrass. Elevation is 6,200 to 6,300 feet. The average annual precipitation is about 9 to 11 inches, the mean annual air temperature is 38 to 42 degrees F, and the average freeze-free season is 55 to 65 days.

Typically, the surface layer is very dark grayish brown loam about 3 inches thick. The upper 11 inches of the subsoil is black clay, and the lower 4 inches is dark brown clay. The substratum to a depth of 60 inches or more is brown loam and silt loam.

Included in this unit are about 6 percent Nevka loam, wet, in the slightly higher lying areas; 5 percent Bear Lake silt loam in shallow depressional areas; 3 percent Bear Lake silty clay loam, saline-alkali, intermingled throughout the unit; and 3 percent Rich silt loam that has slopes of 0 to 2 percent and is in the slightly higher lying areas.

Permeability of this Rich soil is slow. Available water capacity is about 9 to 10 inches. Effective rooting depth is limited by a seasonal high water table that is at a depth of 2.0 to 3.5 feet from May to July. Runoff is very slow. This soil is subject to rare periods of flooding.

This unit is used for irrigated hay and pasture and for wildlife habitat.

This unit is poorly suited to irrigated hay and pasture. The concentration of salts and alkali in the surface layer limits the production of plants suitable for hay and pasture. Leaching the salts from the surface layer is limited by the high water table; however, drainage and irrigation water management reduce the concentration of salts. Salt-tolerant species are most suitable for planting. If this unit is irrigated, it produces about 5 animal-unit-months of forage per acre.

This map unit is in capability unit Vw-48, irrigated.

RE—Rich silt loam. This very deep, moderately well drained soil is on flood plains of the Bear River. It formed in alluvium derived from mixed parent material. Slopes are 0 to 2 percent and are long. The present vegetation is mainly saltgrass, western wheatgrass, Nevada bluegrass, lanceleaf yellowbrush, and big sagebrush. Elevation is 6,200 to 6,350 feet. The average annual precipitation is about 9 to 11 inches, the mean annual air temperature is 38 to 42 degrees F, and the average freeze-free season is 55 to 65 days.

Typically, the surface layer is dark brown silt loam about 2 inches thick. The upper 12 inches of the subsoil is black clay, and the lower 5 inches is very dark gray clay. The substratum to a depth of 60 inches or more is brown loam.

Included in this unit are about 5 percent Bear Lake silt loam in shallow depressional areas; 5 percent Rich loam, wet, intermingled throughout the unit; 3 percent Nevka loam, wet, in the slightly higher lying areas; and 2 percent Wader loam in old stream channels.

Permeability of this Rich soil is slow. Available water capacity is about 8 to 10 inches. Water supplying capacity is 6 to 8 inches. Effective rooting depth is limited by a seasonal high water table that is at a depth of 42 to 72 inches from May to July. Runoff is very slow, and the hazard of water erosion is slight. This soil is subject to rare periods of flooding.

This unit is used for irrigated hay and pasture and for wildlife habitat.

If this unit is used for irrigated hay and pasture, the main limitations are slow permeability and a short growing season. Because of the slow permeability, the application of water should be regulated so that water does not stand on the surface and damage the crops. If this unit is irrigated, it produces about 5.5 animal-unit-months of forage per acre.

This map unit is in capability units IVs-4, irrigated, and VIIw-45, nonirrigated. It is in the Alkali Bottom range site.

RFD—Richens loam, 10 to 30 percent slopes. This very deep, well drained soil is on hilly to steep mountainsides west of Woodruff. It formed in residuum and colluvium derived dominantly from sandstone. Slopes are long, slightly convex or concave, and dominantly east-facing. The present vegetation is mainly quaking aspen, snowberry, and blue wildrye. Elevation is 7,000 to 8,400 feet. The average annual precipitation is about 24 to 30 inches, the mean annual air temperature is 31 to 36 degrees F, and the average freeze-free season is 40 to 55 days.

Typically, the surface layer is very dark grayish brown loam 24 inches thick. The subsoil to a depth of 60 inches or more is dark reddish brown clay.

Included in this unit are about 10 percent soils, on ridgetops, that are less than 20 inches deep to bedrock and 5 percent soils that have a thin, dark-colored surface layer.

Permeability of this Richens soil is slow. Available water capacity is about 10 to 11 inches. Water supplying capacity is 18 to 23 inches. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate.

This unit is woodland, but it is used primarily for livestock grazing and wildlife habitat.

Management practices and capability classification are not provided for this unit (all in National Forest).

RGF—Richens-Agassiz complex, 25 to 60 percent slopes. This map unit is on mountainsides and ridgetops west of Woodruff. Elevation is 8,200 to 8,700 feet. The average annual precipitation is about 25 to 35 inches, the mean annual air temperature is 32 to 38 degrees F, and the average freeze-free season is 40 to 65 days.

This unit is 45 percent Richens loam, 30 to 60 percent slopes, and 40 percent Agassiz very stony loam, 25 to 60 percent slopes. The Richens soil is on north- and northeast-facing side slopes, and the Agassiz soil on south- and southwest-facing side slopes and on ridgetops. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are about 8 percent Baird Hollow soils on north-facing slopes; 5 percent moderately deep, well drained soils that are fine-textured and are intermingled throughout the Richens soil; and 2 percent Rock outcrop on ridges.

The Richens soil is very deep and well drained. It formed in residuum and colluvium derived dominantly from sandstone. Slopes are long and convex or

concave. The present vegetation is mainly quaking aspen, snowberry, and blue wildrye. Typically, the surface layer is very dark grayish brown loam 24 inches thick. The subsoil to a depth of 60 inches or more is dark reddish brown clay.

Permeability of the Richens soil is slow. Available water capacity is about 10 to 11 inches. Water supplying capacity is 18 to 23 inches. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate.

The Agassiz soil is shallow and somewhat excessively drained. It formed in residuum and colluvium derived dominantly from limestone. Slopes are long and convex or concave. The present vegetation is mainly bluebunch wheatgrass, curlleaf mountainmahogany, and Indian ricegrass. Typically, 2 to 5 percent of the surface is covered with stones. The surface layer is very dark grayish brown very stony loam 10 inches thick. The next layer is dark brown extremely gravelly loam 6 inches thick. Limestone is at a depth of 16 inches. Depth to limestone ranges from 10 to 20 inches.

Permeability of the Agassiz soil is moderate. Available water capacity is about 1 inch to 2 inches. Water supplying capacity is 3 to 10 inches. Effective rooting depth is 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is high.

This unit is used as rangeland and for wildlife habitat.

Management practices and capability classification are not provided for this unit (all in National Forest).

RHC—Richville loam, dry, 4 to 8 percent slopes. This moderately deep, well drained soil is on uplands in the southern part of Rich County. It formed mainly in residuum derived dominantly from sandstone and siltstone. Slopes are medium to long and are slightly convex. They dominantly face north and east. The present vegetation is mainly lanceleaf yellowbrush, Nevada bluegrass, western wheatgrass, and big sagebrush. Elevation is 6,550 to 7,300 feet. The average annual precipitation is about 13 to 16 inches, the mean annual air temperature is 37 to 40 degrees F, and the average freeze-free season is 70 to 90 days.

Typically, the surface layer is dark brown loam about 5 inches thick. The subsoil is yellowish red gravelly loam about 6 inches thick. The substratum is red gravelly clay loam about 23 inches thick. Weathered, fine-grained sandstone is at a depth of 34 inches. Depth to sandstone ranges from 20 to 40 inches.

Included in this unit are about 6 percent Cutoff gravelly loam, 6 to 25 percent slopes, on narrow ridgetops; 4 percent Pancheri silt loam, cool, 5 to 10 percent slopes, intermingled throughout the unit; 3 percent Richville loam, dry, 8 to 15 percent slopes, in the more steeply sloping areas; and 2 percent Bullnel loam, 4 to 15 percent slopes, at the higher elevations in the unit.

Permeability of this Richville soil is moderately slow. Available water capacity is about 5 to 7 inches. Water supplying capacity is 7 to 10 inches. Effective rooting depth is 20 to 40 inches. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used as rangeland and for wildlife habitat.

The potential plant community on this unit is mainly bluebunch wheatgrass, big sagebrush, muttongrass, and antelope bitterbrush. If the range vegetation is seriously deteriorated, seeding is needed. The suitability of the unit for rangeland seeding is fair. The main limitations are depth to bedrock and low available water capacity.

Management practices suitable for use on this unit are proper grazing use and planned grazing systems. Shrubs can be controlled by chemical treatment, mechanical treatment, or prescribed burning.

This map unit is in capability unit VIe-U3, nonirrigated, and in Upland Loam range site.

RHD—Richville loam, dry, 8 to 15 percent slopes. This moderately deep, well drained soil is on hilly uplands throughout the survey area. It formed mainly in residuum derived dominantly from sandstone and siltstone. Slopes are medium in length and are concave or convex. They dominantly face north and east. The present vegetation is mainly big sagebrush, lanceleaf yellowbrush, bluebunch wheatgrass, and antelope bitterbrush. Elevation is 6,100 to 7,200 feet. The average annual precipitation is about 13 to 16 inches, the mean annual air temperature is 37 to 40 degrees F, and the average freeze-free season is 70 to 90 days.

Typically, the surface layer is dark brown loam about 5 inches thick. The subsoil is yellowish red gravelly loam about 6 inches thick. The substratum is yellowish red gravelly clay loam about 23 inches thick. Weathered sandstone is at a depth of 34 inches. Depth to sandstone ranges from 20 to 40 inches.

Included in this unit are about 4 percent Cutoff gravelly loam, 6 to 25 percent slopes, on ridgetops; 2 percent Kearl loam, 4 to 15 percent slopes, on ridgetops; and 3 percent Richville loam, dry, 4 to 8 percent slopes, in the more gently sloping areas.

Permeability of this Richville soil is moderately slow. Available water capacity is about 5.0 to 7.5 inches. Water supplying capacity is 7 to 10 inches. Effective rooting depth is 20 to 40 inches. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used as rangeland and for wildlife habitat.

The potential plant community on this unit is mainly bluebunch wheatgrass, big sagebrush, muttongrass, and antelope bitterbrush. The suitability of the unit for rangeland seeding is fair. The main limitations are depth to bedrock and low available water capacity.

Management practices suitable for use on this unit are proper grazing use and planned grazing systems. Shrubs can be controlled by chemical treatment, mechanical treatment, or prescribed burning.

This map unit is in capability unit VIe-U3, nonirrigated, and in Upland Loam range site.

SA—Saleratus loam. This very deep, poorly drained soil is mainly on the Bear River and Saleratus Creek flood plains. It formed in alluvium derived from mixed parent material. Slopes are 0 to 1 percent. They are long and slightly undulating. The present vegetation is mainly broadleaf sedges, wiregrass, foxtail, bluegrass, and hairgrass. Elevation is 6,200 to 6,430 feet. The average annual precipitation is about 9 to 11 inches, the mean annual air temperature is 38 to 42 degrees F, and the average freeze-free season is 55 to 65 days.

Typically, the surface layer is dark grayish brown loam about 6 inches thick. The next 11 inches is dark yellowish brown loam. Below this is a buried surface layer of dark brown silt loam about 6 inches thick. The next layer, to a depth of 45 inches, is strong brown silt loam. Below this to a depth of 60 inches or more is a buried surface layer of dark grayish brown silty clay loam.

Included in this unit are about 7 percent very deep, poorly drained soils that are clayey and are intermingled throughout the unit; 5 percent Saleratus loam, saline-alkali, in the slightly higher lying areas; 3 percent Nevka loam, wet, in the slightly higher lying areas; and 2 percent Hival silty clay loam intermingled throughout the unit. Also included are small areas of Cowco loam, 0 to 3 percent slopes, on alluvial fans. Included areas make up about 20 percent of the total acreage.

Permeability of this Saleratus soil is slow. Available water capacity is about 10 to 11 inches. Effective rooting depth is limited by a seasonal high water table that is at a depth of 18 to 30 inches from May to July. Runoff is very slow, and the hazard of water erosion is slight. This soil is subject to rare periods of flooding.

This unit is used for irrigated hay and pasture and for wildlife habitat.

This unit is well suited to irrigated hay and pasture. The main limitations are the high water table and a short growing season. If drainage is not provided, plants that tolerate a seasonal high water table should be selected. If this unit is irrigated, it produces about 6 animal-unit-months of forage per acre.

This map unit is in capability unit IVw-4, irrigated.

SB—Saleratus loam, saline-alkali. This very deep, poorly drained soil is mainly on the Bear River and Saleratus Creek flood plains. The soil formed in alluvium derived from mixed parent material. Slopes are 0 to 2 percent. They are long and slightly undulating. The present vegetation is mainly broadleaf sedges, foxtail, greasewood, and lanceleaf yellowbrush. Elevation is 6,200 to 6,430 feet. The average annual precipitation is about 9 to 11 inches, the mean annual air temperature is 38 to 42 degrees F, and the average freeze-free season is 55 to 65 days.

Typically, the surface layer is dark brown loam about 4 inches thick. The next layer is brown loam and silt loam about 20 inches thick. Below this is a buried surface layer of dark brown silty clay loam about 12 inches thick. The underlying material to a depth of 60 inches or more is reddish brown silty clay loam.

Included in this unit are about 8 percent Nevka loam in the slightly higher lying areas; 5 percent very deep, poorly drained soils that are clayey and are intermingled throughout the unit; 2 percent Saleratus loam in shallow depressional areas and abandoned stream channels; and 2 percent Hival silty clay loam intermingled throughout the unit.

Permeability of this Saleratus soil is slow. Available water capacity is about 8.0 to 9.5 inches. Effective rooting depth is limited by a seasonal high water table that is at a depth of 18 to 30 inches from May to July. Runoff is slow, and the hazard of water erosion is slight. This soil is subject to rare periods of flooding.

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

This unit is poorly suited to irrigated hay and pasture. The concentration of salts and alkali in the surface layer limits the production of plants suitable for hay and pasture. Leaching of the salts is limited by the high water table; however, drainage and irrigation water management reduce the concentration of salts. Salt-tolerant species are most suitable for planting. If this unit is irrigated, it produces about 5 animal-unit-months of forage per acre.

The potential plant community on this unit is mainly saltgrass, alkali sacaton, alkali bluegrass, and basin wildrye. The suitability of the unit for rangeland seeding is very poor. The main limitation is the content of salts and alkali in the soil.

Management practices suitable for use on this unit are proper grazing use and planned grazing systems.

If this unit is used for homesite development, the main limitations are the high water table, slow permeability, and the hazard of flooding. Slow permeability and the high water table increase the possibility of failure of septic tank absorption fields.

This map unit is in capability units IVw-48, irrigated, and VIIw-8, nonirrigated. It is in Alkali Bottoms range site.

SC—Saleratus Variant-Canburn Variant complex. This map unit is on beaches along the shores of Bear Lake. Slopes are 0 to 2 percent. Elevation is 5,925 to 5,950 feet. The average annual precipitation is about 12 to 14 inches, the mean annual air temperature is 42 to 44 degrees F, and the average freeze-free season is 85 to 90 days.

This unit is 45 percent Saleratus Variant loamy fine sand and 45 percent Canburn Variant loamy sand. The Saleratus Variant soil is dominantly on slightly convex

side slopes, and the Canburn Variant soil is dominantly in shallow depressional areas. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are about 8 percent Wader Variant gravelly loam along stream channels and 2 percent Duckree loam, 0 to 3 percent slopes, in areas not subject to wave action.

The Saleratus Variant soil is very deep and somewhat poorly drained. It formed in beach deposits derived from mixed parent material. Slopes are short to medium in length and are convex. The present vegetation is mainly wiregrass, jointgrass, and Kentucky bluegrass.

Typically, the surface layer of the Saleratus Variant soil is brown loamy fine sand about 3 inches thick. The underlying material to a depth of 60 inches or more ranges from brown fine sand to gravelly coarse sand.

Permeability of the Saleratus Variant soil is rapid. Available water capacity is about 3 to 4 inches. Effective rooting depth is limited by a seasonal high water table that is at a depth of 12 to 36 inches from May to July. Runoff is slow, and the hazard of water erosion is slight.

The Canburn Variant soil is very deep and somewhat poorly drained. It formed in beach deposits derived from mixed parent material. Slopes are short to medium in length and are concave. The present vegetation is mainly water birch, willows, broadleaf sedges, wiregrass, and cottonwood.

Typically, the surface layer of the Canburn Variant soil is very dark brown loamy sand about 18 inches thick. The upper 7 inches of the underlying material is gray loamy sand, and the lower part to a depth of 60 inches or more is brown loamy fine sand.

Permeability of the Canburn Variant soil is rapid. Available water capacity is about 4.5 to 5.5 inches. Effective rooting depth is limited by a seasonal high water table that is at a depth of 12 to 24 inches from May to July. Runoff is very slow, and the hazard of water erosion is slight. This soil is subject to occasional periods of flooding in spring.

This unit is used for homesite development, recreation, and wildlife habitat.

This unit is poorly suited to homesite development. The main limitations are wetness and the hazards of frost action and cutbanks caving in. The high water table increases the possibility of failure of septic tank absorption fields. If drainage is not provided, landscaping plants that tolerate a seasonal high water table should be selected.

If this unit is used for recreational development, the main limitations are wetness and the sandy texture of the soils. Drainage should be provided for paths and trails. Bases for roads should be drained and compacted. Areas used for recreation can be protected from soil blowing and dust by maintaining plant cover.

This map unit is in capability unit VIw-3, irrigated.

SDF—Sambrito sandy loam, 25 to 60 percent slopes. This very deep, well drained soil is on mountainsides along the western boundary of Rich County. It formed in colluvium derived dominantly from sandstone. Slopes are long and convex or concave. They face all directions, but they dominantly face north below an elevation of 8,000 feet. The present vegetation is mainly Douglas-fir, lodgepole pine, and subalpine fir with an understory of russet buffaloberry, dwarf blueberry, and snowberry. Elevation is 6,800 to 9,000 feet. The average annual precipitation is about 30 to 40 inches, the mean annual air temperature is 32 to 38 degrees F, and the average freeze-free season is 30 to 60 days.

Typically, the surface is covered with a mat of partially decomposed leaves and twigs about 1 inch thick. The surface layer is very dark grayish brown sandy loam 2 inches thick. The subsoil is dark brown fine sandy loam 29 inches thick. The substratum to a depth of 60 inches or more is dark brown sandy loam and strong brown loamy sand.

Included in this unit are about 10 percent Condie gravelly loam, 25 to 40 percent slopes, intermingled throughout the unit; 3 percent Dagan gravelly loam, moist, 25 to 40 percent slopes, on convex side slopes; and 2 percent Baird Hollow silt loam, 10 to 25 percent slopes, on concave side slopes. The vegetation is mainly aspen on the Baird Hollow soil, and it is mainly sagebrush and grasses on the Dagan soil.

Permeability of this Sambrito soil is moderately rapid. Available water capacity is about 4 to 5 inches. Water supplying capacity is 12 to 14 inches. Effective rooting depth is 60 inches or more. Runoff is rapid, and the hazard of water erosion is moderate.

This unit is used as woodland and for wildlife habitat.

This unit is well suited to lodgepole pine and Douglas-fir. Based on a site index of 80, the potential production per acre of merchantable timber is 690 cubic feet, or 2,800 board feet (International rule), from an even-aged, fully stocked stand of trees 100 years old. Minimizing the risk of erosion is essential in harvesting timber.

This map unit is in capability unit VIIe-HC, nonirrigated, and in woodland suitability group 3o7.

SEE—Scout very stony loam, 10 to 40 percent slopes. This very deep, well drained soil is on mountainsides west of Bear Lake and along the upper part of Woodruff Creek. It formed in colluvium derived dominantly from quartzite and sandstone. Slopes are long and are convex or concave. They face north and east. The present vegetation is mainly Douglas-fir with an understory of bearded wheatgrass. Elevation is 8,000 to 9,000 feet. The average annual precipitation is about 25 to 35 inches, the mean annual air temperature is 31 to 35 degrees F, and the average freeze-free season is 30 to 50 days.

Typically, the surface is covered with a mat of conifer needles and twigs and decayed organic material about 2 inches thick. From 10 to 15 percent of the surface is covered with stones and boulders. The surface layer is dark brown very stony loam about 4 inches thick. The subsurface layer is dark brown very stony loam about 17 inches thick. The subsoil is brown very cobbly loam about 10 inches thick. The substratum to a depth of 60 inches or more is reddish yellow and strong brown very cobbly fine sandy loam and extremely cobbly fine sandy loam.

Included in this unit are about 6 percent Flygare gravelly loam, 25 to 50 percent slopes, under stands of aspen; 5 percent Foxol extremely stony sandy loam, 30 to 60 percent slopes, under shrubs and grasses; 3 percent Rock outcrop; and 1 percent Rubble Land.

Permeability of this Scout soil is moderately rapid. Available water capacity is about 4.5 to 5.5 inches. Water supplying capacity is 11 to 16 inches. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used as woodland and for wildlife habitat.

This unit is poorly suited to the production of Douglas-fir. Based on a site index of 55, the potential production per acre of merchantable timber is 1,400 cubic feet, or 5,600 board feet (International rule), from an even-aged, fully stocked stand of trees 100 years old. Minimizing the risk of erosion is essential in harvesting timber. Stones on the surface can interfere with felling, yarding, and other operations involving the use of equipment.

This map unit is in capability unit VIIs-HC, nonirrigated, and in woodland suitability group 4f3.

SFD—Searla very gravelly silt loam, 8 to 25 percent slopes. This deep, well drained soil is on cinder cones of Black Mountain, north of South Eden Canyon. It formed in colluvium and residuum derived dominantly from basalt. Slopes are long and convex or concave. The present vegetation is mainly bluebunch wheatgrass, big sagebrush, antelope bitterbrush, and serviceberry. Elevation is 7,200 to 7,700 feet. The average annual precipitation is about 14 to 16 inches, the mean annual air temperature is 38 to 42 degrees F, and the average freeze-free season is 65 to 80 days.

Typically, the surface layer is very dark brown very gravelly silt loam about 8 inches thick. The subsoil is dark brown extremely gravelly silty clay loam about 16 inches thick. The substratum is brown very gravelly silt loam about 17 inches thick. Fractured basalt is at a depth of 41 inches. Depth to bedrock ranges from 40 to 60 inches.

Included in this unit are about 3 percent areas of Rock outcrop on ridges and steep hillsides and 2 percent areas of Rubble Land on steep hillsides.

Permeability of this Searla soil is moderately slow. Available water capacity is about 3.5 to 5.0 inches. Water supplying capacity is 7 to 9 inches. Effective rooting depth is 40 to 60 inches. Runoff is rapid, and the hazard of water erosion is moderate.

This unit is used as rangeland and for wildlife habitat.

The potential plant community on this unit is mainly bluebunch wheatgrass, black sagebrush, muttongrass, and antelope bitterbrush. The suitability of the unit for rangeland seeding is poor. The main limitations are low available water capacity and rock fragments on the surface.

Management practices that maintain or improve the range vegetation include proper grazing use, planned grazing systems, fencing, and stock water developments.

This map unit is in capability unit VIs-U4, nonirrigated, and in Upland Stony Loam range site.

SGF—Slinger gravelly loam, 25 to 40 percent slopes. This moderately deep, somewhat excessively drained soil is on foothills in the southwestern part of Rich County. It formed in residuum and colluvium derived dominantly from sandstone. Slopes are medium in length and are slightly convex. The present vegetation is mainly black sagebrush, bluebunch wheatgrass, and lanceleaf yellowbrush. Elevation is 6,400 to 7,400 feet. The average annual precipitation is about 9 to 14 inches, the mean annual air temperature is 37 to 40 degrees F, and the average freeze-free season is 55 to 75 days.

Typically, the surface layer is reddish brown gravelly loam 5 inches thick. The next layer, to a depth of 14 inches, is yellowish red gravelly loam. The next layer is red very gravelly loam 4 inches thick. Sandstone is at a depth of 23 inches. Depth to sandstone ranges from 20 to 40 inches.

Included in this unit are about 6 percent Alhark loam, 15 to 30 percent slopes, on east- and north-facing side slopes; 6 percent Solak gravelly loam, 10 to 50 percent slopes, on ridgetops; and 3 percent Duckree gravelly silt loam, 15 to 40 percent slopes, in slightly concave areas. Included areas make up about 15 percent of the total acreage.

Permeability of this Slinger soil is moderate. Available water capacity is about 2 to 4 inches. Water supplying capacity is 3 to 6 inches. Effective rooting depth is 20 to 40 inches. Runoff is very rapid, and the hazard of water erosion is very high.

This unit is used as rangeland and for wildlife habitat.

The potential plant community on this unit is mainly Indian ricegrass, bluebunch wheatgrass, shadscale, and black sagebrush. The suitability of the unit for rangeland seeding is poor. The main limitations are low available water capacity, depth to bedrock, and slope.

Management practices that maintain or improve the range vegetation include proper grazing use, planned grazing systems, fencing, and stock water development.

This map unit is in capability unit VIIs-S4, nonirrigated, and in Semidesert Stony Loam range site.

SHF—Solak gravelly loam, 10 to 50 percent slopes. This shallow, somewhat excessively drained soil is on ridges and foothills throughout the survey area. It formed in residuum and colluvium derived dominantly from conglomerate composed of sandstone, limestone, and quartzite. Slopes are long and convex. They face south and west. The present vegetation is mainly low sagebrush, Hood phlox, bluebunch wheatgrass, and black sagebrush. Elevation is 6,000 to 7,500 feet. The average annual precipitation is about 12 to 14 inches, the mean annual air temperature is 37 to 43 degrees F, and the average freeze-free season is 70 to 85 days.

Typically, the surface layer is brown gravelly loam about 5 inches thick. The next layer is light brown very gravelly loam and pink extremely gravelly loam about 10 inches thick. Conglomerate is at a depth of 15 inches. Depth to bedrock ranges from 10 to 20 inches.

Included in this unit are about 7 percent Jebo very gravelly loam, 25 to 40 percent slopes, on the lower part of side slopes; 5 percent Rock outcrop; 4 percent Duckree gravelly silt loam, 15 to 40 percent slopes, in concave areas; and 4 percent Falula very gravelly loam, 4 to 25 percent slopes, on ridgetops.

Permeability of this Solak soil is moderate. Available water capacity is about 1 inch to 2 inches. Water supplying capacity is 2.0 to 4.5 inches. Effective rooting depth is 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is high.

This unit is used mainly as rangeland and for wildlife habitat. A few areas are used for homesite development.

The potential plant community on this unit is mainly bluebunch wheatgrass, big sagebrush, black sagebrush, and Sandberg bluegrass. The suitability of the unit for rangeland seeding is poor. The main limitations are low available water capacity and depth to bedrock.

Management practices that maintain or improve the range vegetation include proper grazing use, planned grazing systems, fencing, and stock water developments.

If this unit is used for homesite development, the main limitations are depth to bedrock and steepness of slope. The deep cuts needed to provide essentially level building sites can expose bedrock. Erosion is a hazard in the steeper areas.

This map unit is in capability unit VIIs-U3, nonirrigated, and in Upland Shallow Loam range site.

SJF—Solak gravelly loam, dry, 25 to 60 percent slopes. This shallow, somewhat excessively drained soil is on mountainsides in the southern half of the Crawford Mountains, northeast of Woodruff. It formed in residuum and colluvium derived dominantly from limestone and sandstone. Slopes are long and convex. The present vegetation is mainly bluebunch wheatgrass, black sagebrush, Utah juniper, and pricklypear. Elevation is 6,350 to 7,750 feet. The average annual precipitation is about 9 to 11 inches, the mean annual air temperature is 36 to 40 degrees F, and the average freeze-free season is 50 to 75 days.

Typically, the surface layer is brown gravelly loam about 5 inches thick. The underlying material is yellowish brown very gravelly loam about 7 inches thick. Limestone is at a depth of about 12 inches. Depth to limestone ranges from 10 to 20 inches.

Included in this unit are about 5 percent Bequinn very gravelly loam, 30 to 50 percent slopes, on toe slopes and 5 percent Lundy very gravelly loam, on ridgetops, that is dry and has slopes of 25 to 60 percent. Also included is 3 percent Woodpass loam, 2 to 8 percent slopes, in the more gently sloping areas.

Permeability of this Solak soil is moderate. Available water capacity is about 1 inch to 2 inches. Water supplying capacity is 2 to 4 inches. Effective rooting depth is 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is high.

This unit is woodland, but it is used primarily as rangeland and for wildlife habitat.

The potential plant community on this unit is Utah juniper with an understory of bluebunch wheatgrass, Indian ricegrass, and Nevada bluegrass.

Management practices that maintain or improve the range vegetation include proper grazing use, planned grazing systems, fencing, and stock water developments.

This unit is poorly suited to the production of Utah juniper. The site index for Utah juniper is 15. The soil in the unit can produce 2 cords per acre in a stand of trees that average 5 inches in diameter at a height of 1 foot.

This map unit is in capability unit VIIs-S3J, nonirrigated, and in woodland suitability group 3d5.

SKF—Solak-Ranruff-Rock outcrop complex, 30 to 60 percent slopes. This map unit is on foothills east of Bear Lake and southwest of Woodruff. Slopes are medium to long and are convex or concave. They face south and west. The present vegetation is mainly Utah juniper, big sagebrush, Hood phlox, and Sandberg bluegrass. Elevation is 6,000 to 7,300 feet. The average annual precipitation is about 11 to 14 inches, the mean annual air temperature is 38 to 44 degrees F, and the average freeze-free season is 60 to 85 days.

This unit is 40 percent Solak very cobbly loam, 35 percent Ranruff gravelly loam, and 10 percent Rock outcrop. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are about 6 percent shallow, somewhat excessively drained gravelly loam that is more than 35 percent gravel throughout and 5 percent Lariat fine sandy loam, 4 to 10 percent slopes, on east-facing side slopes. Also included are small areas of Jebo very gravelly loam, on ridgetops, that has slopes of 10 to 50 percent. Included areas make up about 15 percent of the total acreage.

The Solak soil is shallow and somewhat excessively drained. it formed in residuum and colluvium derived from sandstone and some limestone. Typically, the surface layer is yellowish brown very cobbly loam 4 inches thick. The underlying material is brown very gravelly loam 11 inches thick. Fractured sandstone is at a depth of 15 inches. Depth to sandstone ranges from 10 to 20 inches.

Permeability of the Solak soil is moderate. Available water capacity is about 1 inch to 2 inches. Water supplying capacity is 2 to 5 inches. Effective rooting depth is 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is high.

The Ranruff soil is shallow and somewhat excessively drained. It formed in residuum and colluvium derived dominantly from sandstone. Typically, the surface layer is reddish yellow gravelly loam 5 inches thick. The underlying material is light red gravelly loam 11 inches thick. Fractured sandstone is at a depth of 16 inches. Depth to sandstone ranges from 10 to 20 inches.

Permeability of the Ranruff soil is moderate. Available water capacity is about 1.5 to 2.5 inches. Water supplying capacity is 2 to 5 inches. Effective rooting depth is 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is high.

Rock outcrop consists of areas of exposed sandstone and some limestone. It occurs mainly as ledges and cliffs. Runoff is very rapid.

This unit is woodland, but it is used primarily for livestock grazing and wildlife habitat.

The potential plant community on this unit is Utah juniper with an understory of bluebunch wheatgrass, Indian ricegrass, muttongrass, and Nevada bluegrass. Management practices that maintain or improve the range vegetation include proper grazing use, planned grazing systems, fencing, and stock water developments.

This unit is poorly suited to Utah juniper. The site index for Utah juniper is 30 to 38. The soil in the unit can produce 5.5 cords per acre in a stand of trees that average 5 inches in diameter at a height of 1 foot.

This map unit is in capability unit VIIs-U3J, nonirrigated, and in woodland suitability group 3d5.

SLE—St. Marys loam, 10 to 40 percent slopes. This deep, well drained soil is on mountainsides and ridges along the western and southwestern boundaries of Rich County. It formed in colluvium derived dominantly from conglomerate. Slopes are long and convex or concave. They face south, east, and west. The present vegetation is mainly bluebunch wheatgrass, antelope bitterbrush, and big sagebrush. Elevation is 7,000 to 8,900 feet. The average annual precipitation is about 18 to 22 inches, the mean annual air temperature is 34 to 38 degrees F, and the average freeze-free season is 40 to 65 days.

Typically, the surface layer is dark reddish brown loam 10 inches thick. The subsoil is dark reddish brown extremely cobbly loam 22 inches thick. The substratum is dark red extremely cobbly loam 13 inches thick. Sandstone is at a depth of 45 inches. Depth to sandstone ranges from 40 to 60 inches.

Included in this unit are about 10 percent soils that are similar to this St. Marys soil but are under stands of aspen and 5 percent Agassiz stony loam that has slopes of 25 to 60 percent and is on ridgetops.

Permeability of this St. Marys soil is moderate. Available water capacity is about 4 to 5 inches. Water supplying capacity is 9 to 14 inches. Effective rooting depth is 40 to 60 inches. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used as rangeland and for wildlife habitat.

Management practices and capability classification are not provided for this unit (all in National Forest).

SME—St. Marys-Yeljack, north loams, 10 to 40 percent slopes. This map unit is on mountainsides in the Monte Cristo Peak area, along the boundary between Rich and Cache Counties. Elevation is 7,000 to 8,400 feet. The average annual precipitation is about 18 to 22 inches, the mean annual air temperature is 34 to 38 degrees F, and the average freeze-free season is 40 to 65 days.

This unit is 60 percent St. Marys loam and 30 percent Yeljack loam, north. The St. Marys soil is on south- and west-facing side slopes and is under grasses and shrubs. The Yeljack soil is on north- and northeast-facing side slopes and is under stands of aspen. Aspect greatly influences the amount of effective precipitation the soils receive. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are about 8 percent shallow soils on ridgetops and 2 percent areas of Rock outcrop on ridgetops.

The St. Marys soil is deep and well drained. It formed in colluvium derived dominantly from conglomerate. Slopes are long and convex or concave. The present vegetation is mainly bluebunch wheatgrass, antelope bitterbrush, and big sagebrush.

Typically, the surface layer of the St. Marys soil is dark reddish brown loam 10 inches thick. The subsoil is dark reddish brown extremely cobbly loam 22 inches thick. The substratum is dark red extremely cobbly loam 13 inches thick. Sandstone is at a depth of 45 inches. Depth to sandstone ranges from 40 to 60 inches.

Permeability of the St. Marys soil is moderate. Available water capacity is about 4 to 5 inches. Water supplying capacity is 9 to 14 inches. Effective rooting depth is 40 to 60 inches. Runoff is medium, and the hazard of water erosion is moderate.

The Yeljack soil is very deep and well drained. It formed in colluvium and local alluvium derived dominantly from sandstone. Slopes are long and convex or concave. The present vegetation is mainly quaking

aspen, aspen peavine, blue wildrye, and mountain brome.

Typically, the surface layer of the Yeljack soil is dark grayish brown loam 14 inches thick. The subsurface layer is dark brown fine sandy loam 18 inches thick. The subsoil to a depth of 60 inches or more is yellowish red sandy clay loam.

Permeability of the Yeljack soil is moderately slow. Available water capacity is about 8 to 10 inches. Water supplying capacity is 13 to 18 inches. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate.

This unit is woodland, but it is used primarily for livestock grazing and wildlife habitat.

Management practices and capability classification are not provided for this unit (all in National Forest).

SNF—Sumine stony loam, 25 to 50 percent slopes. This moderately deep, well drained soil is on foothills and ridges west and south of Bear Lake. It formed in residuum and colluvium derived dominantly from quartzite. Slopes are long and convex or concave. The present vegetation is mainly big sagebrush, low sagebrush, bluebunch wheatgrass, antelope bitterbrush, and lanceleaf yellowbrush. Elevation is 6,000 to 7,000 feet. The average annual precipitation is about 12 to 14 inches, the mean annual air temperature is 40 to 44 degrees F, and the average freeze-free season is 70 to 85 days.

Typically, the surface layer is very dark grayish brown stony loam about 8 inches thick. The subsoil is brown and dark brown extremely cobbly loam about 14 inches thick. The substratum is reddish brown extremely cobbly sandy loam about 6 inches thick. Fractured quartzite is at a depth of 28 inches. Depth to bedrock ranges from 20 to 40 inches.

Included in this unit are about 6 percent deep, very cobbly soils intermingled throughout the unit; 4 percent Foxol very stony loam, 10 to 40 percent slopes, on ridges; 3 percent soils, on ridges, that are similar to this Sumine soil but have slopes of less than 25 percent; and 2 percent Rock outcrop in steep, convex areas on foothills and ridges.

Permeability of this Sumine soil is moderate. Available water capacity is about 2 to 3 inches. Water supplying capacity is 3 to 6 inches. Effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high.

This unit is used mainly as rangeland and for wildlife habitat. It is also used for homesite development.

The potential plant community on this unit is bluebunch wheatgrass, black sagebrush, muttongrass, and antelope bitterbrush. The suitability of the unit for rangeland seeding is very poor. The main limitations are slope, depth to bedrock, and rock fragments in the surface layer.

Management practices that maintain or improve the range vegetation include proper grazing use, planned grazing systems, fencing, and stock water developments. Shrubs can be controlled by chemical treatment.

If this unit is used for homesite development, the main limitations are steepness of slope and depth to rock. Cuts needed to provide essentially level building sites can expose bedrock.

Slope is a concern in installing septic tank absorption fields. Absorption lines should be installed on the contour.

This map unit is in capability unit VIIs-U3, nonirrigated, and in Upland Stony Loam range site.

TAB—Thatcher silt loam, 1 to 5 percent slopes. This very deep, well drained soil is on foothills and plateaus east of Bear Lake. It formed in local alluvium and colluvium derived dominantly from sandstone. Slopes are long and convex or concave. The present vegetation is mainly big sagebrush, Idaho fescue, bluebunch wheatgrass, western wheatgrass, and lanceleaf yellowbrush. Elevation is 6,500 to 7,500 feet. The average annual precipitation is about 14 to 16 inches, the mean annual air temperature is 36 to 44 degrees F, and the average freeze-free season is 60 to 80 days.

Typically, the surface layer is dark brown silt loam about 13 inches thick. The upper 18 inches of the subsoil is brown silty clay loam, and the lower 11 inches is brownish red silty clay loam. The substratum to a depth of 60 inches or more is yellowish red silt loam and fine sandy loam. A layer of secondary calcium carbonate is at a depth of about 31 inches.

Included in this unit are about 5 percent Kearl loam, 4 to 15 percent slopes, intermingled throughout the unit; 5 percent Gobine silt loam, 1 to 10 percent slopes, intermingled throughout the unit; 3 percent Dennot very gravelly loam, 4 to 15 percent slopes, on alluvial fans near the mouth of small drainageways; and 2 percent Falula gravelly silt loam, 1 to 10 percent slopes, in convex areas.

Permeability of this Thatcher soil is moderately slow. Available water capacity is about 10 to 11 inches. Water supplying capacity is 11 to 12 inches. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used for nonirrigated crops, as rangeland, and for wildlife habitat.

This unit is well suited to nonirrigated small grain. A crop-fallow system should be used. Maintaining crop residue on or near the surface reduces runoff, reduces soil blowing, and helps to maintain soil tilth and organic matter content. Tillage should be kept to a minimum. This unit produces about 25 bushels of wheat per acre.

The potential plant community on this unit is mainly bluebunch wheatgrass, antelope bitterbrush, Indian

ricegrass, and big sagebrush. The suitability of the unit for rangeland seeding is good.

Management practices suitable for use on this unit are proper grazing use and planned grazing systems. Shrubs can be controlled by chemical treatment, mechanical treatment, or prescribed burning.

This map unit is in capability unit IVe-U, nonirrigated, and in Upland Loam range site.

TAD—Thatcher silt loam, 5 to 10 percent slopes. This very deep, well drained soil is on foothills and plateaus east of Bear Lake. It formed in local alluvium and residuum derived dominantly from sandstone. Slopes are long and convex or concave. The present vegetation is mainly big sagebrush, bluebunch wheatgrass, lanceleaf yellowbrush, and Idaho fescue. Elevation is 6,500 to 7,500 feet. The average annual precipitation is about 14 to 16 inches, the mean annual air temperature is 36 to 44 degrees F, and the average freeze-free season is 60 to 80 days.

Typically, the surface layer is dark brown silt loam 11 inches thick. The upper 16 inches of the subsoil is dark brown silty clay loam, and the lower 11 inches is reddish brown silty clay loam. The substratum to a depth of 60 inches or more is yellowish red loam. A layer of secondary calcium carbonate accumulation is at a depth of about 27 inches.

Included in this unit are about 5 percent Gobine silt loam, 1 to 10 percent slopes, intermingled throughout the unit; 3 percent Dennot very gravelly loam, 4 to 15 percent slopes, on alluvial fans near the mouth of small drainageways; 2 percent Kearl loam, 4 to 15 percent slopes, intermingled throughout the unit; and 2 percent Falula gravelly silt loam, 1 to 10 percent slopes, in slightly convex areas.

Permeability of this Thatcher soil is moderately slow. Available water capacity is 10 to 11 inches. Water supplying capacity is 11 to 12 inches. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used for nonirrigated crops and wildlife habitat and as rangeland.

This unit is well suited to nonirrigated small grain. A crop-fallow system should be used. Maintaining crop residue on or near the surface reduces runoff, reduces soil blowing, and helps to maintain soil tilth and organic matter content. Tillage should be kept to a minimum. This unit produces 25 bushels of wheat per acre.

The potential plant community on this unit is mainly bluebunch wheatgrass, bitterbrush, Indian ricegrass, and big sagebrush. The suitability of the unit for rangeland seeding is good.

Management practices suitable for use on this unit are proper grazing use and planned grazing systems. Shrubs can be controlled by chemical treatment, mechanical treatment, or prescribed burning.

This map unit is in capability unit IVe-U, nonirrigated, and in Upland Loam range site.

TAE—Thatcher silt loam, 10 to 20 percent slopes. This very deep, well drained soil is on foothills east of Bear Lake. It formed in colluvium derived dominantly from sandstone. Slopes are medium to long and are convex. The present vegetation is mainly big sagebrush, Idaho fescue, bluebunch wheatgrass, and lanceleaf yellowbrush. Elevation is 6,500 to 7,500 feet. The average annual precipitation is about 14 to 16 inches, the mean annual air temperature is 36 to 44 degrees F, and the average freeze-free season is 60 to 80 days.

Typically, the surface layer is dark brown silt loam about 10 inches thick. The subsoil is brown silty clay loam about 25 inches thick. The substratum to a depth of 60 inches or more is brown silt loam. A layer of secondary calcium carbonate accumulation is at a depth of about 22 inches.

Included in this unit are about 5 percent Kearl loam, 15 to 25 percent slopes, on convex ridgetops; 5 percent Dagan gravelly silt loam, 25 to 40 percent slopes, on stream-cut valley sides; 2 percent Gridge stony loam that has slopes of 25 to 40 percent and is on stream-cut valley sides; and 2 percent Ellett silt loam, 10 to 30 percent slopes, on toe slopes. Also included are small areas of Rock outcrop on stream-cut valley sides. Included areas make up about 15 percent of the total acreage.

Permeability of this Thatcher soil is moderately slow. Available water capacity is about 10 to 11 inches. Water supplying capacity is 11 to 12 inches. Effective rooting depth is 60 inches or more. Runoff is rapid, and the hazard of water erosion is high.

This unit is used as rangeland and for wildlife habitat and nonirrigated crops.

The potential plant community on this unit is mainly bluebunch wheatgrass, antelope bitterbrush, Indian ricegrass, and big sagebrush. The suitability of the unit for rangeland seeding is fair. The main limitation is slope.

Management practices suitable for use on this unit are proper grazing use and planned grazing systems. Shrubs can be controlled by chemical treatment.

If this unit is used for nonirrigated crops, the main limitations are steepness of slope. Seedbed preparation should be on the contour or across the slope where practical. Maintaining crop residue on or near the surface reduces runoff, reduces soil blowing, and helps to maintain soil tilth and organic matter content. Tillage should be kept to a minimum.

This map unit is in capability unit VIe-U, nonirrigated, and in Upland Loam range site.

TBA—Thatcher silt loam, warm, 1 to 3 percent slopes. This very deep, well drained soil is on alluvial fans around Bear Lake. It formed in alluvium derived dominantly from sandstone, limestone, and quartzite.

Slopes are long and slightly undulating. The present vegetation is mainly big sagebrush, bluegrass, basin wildrye, and bluebunch wheatgrass. Elevation is 5,930 to 6,040 feet. The average annual precipitation is about 12 to 16 inches, the mean annual air temperature is 40 to 44 degrees F, and the average freeze-free season is 80 to 90 days.

Typically, the surface layer is dark brown silt loam about 11 inches thick. The upper 11 inches of the subsoil is brown and reddish brown silty clay loam, and the lower 12 inches is yellowish red silty clay loam. The substratum to a depth of 60 inches or more is reddish brown very gravelly loam.

Included in this unit are small areas of Dennot very gravelly loam, 4 to 15 percent slopes, at the mouth of canyons; Thatcher silt loam, warm, 3 to 6 percent slopes, in the steeper areas; and Bear Lake silt loam in the lower lying areas along stream channels.

Permeability of this Thatcher soil is moderately slow. Available water capacity is about 8 to 9 inches. Water supplying capacity is 9 to 11 inches. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is slight.

This unit is used mainly for irrigated and nonirrigated crops and homesite development. Some areas are used as rangeland and for wildlife habitat.

This unit is well suited to irrigated and nonirrigated crops. It is limited mainly by the length of the growing season. Crop residue left on or near the surface helps to conserve moisture, maintain tilth, and control erosion. Tillage should be kept to a minimum. If this unit is irrigated, it produces about 4.5 tons of alfalfa per acre, 85 bushels of barley per acre, 3 tons of raspberries per acre, or 9 animal-unit-months of forage per acre. The unit also produces about 30 bushels of nonirrigated wheat per acre.

This unit is well suited to homesite development. Septic tank filter fields should be placed below the slowly permeable layer. In summer, irrigation is needed for lawn grasses, shrubs, vines, shade trees, and ornamental trees.

The potential plant community on this unit is mainly bluebunch wheatgrass, antelope bitterbrush, Indian ricegrass, and big sagebrush. The suitability of the unit for rangeland seeding is good.

Management practices suitable for use on this unit are proper grazing use and planned grazing systems. Shrubs can be controlled by chemical treatment, mechanical treatment, or prescribed burning.

This map unit is in capability units IIIc-3, irrigated, and IVc-U, nonirrigated. It is in Upland Loam range site.

TBB—Thatcher silt loam, warm, 3 to 6 percent slopes. This very deep, well drained soil is on alluvial fans around Bear Lake. It formed in alluvium derived dominantly from sandstone, limestone, and quartzite. Slopes are long and slightly convex. The present vegetation is mainly big sagebrush, bluebunch wheatgrass, slender wheatgrass, and lanceleaf yellowbrush. Elevation is 5,940 to 6,700 feet. The average annual precipitation is about 12 to 16 inches, the mean annual air temperature is 40 to 44 degrees F, and the average freeze-free season is 80 to 90 days.

Typically, the surface layer is very dark gray silt loam about 13 inches thick. The upper 10 inches of the subsoil is dark grayish brown silty clay loam, and the lower 10 inches is dark brown clay loam. The upper 11 inches of the substratum is light gray silty clay loam, and the lower part to a depth of 60 inches or more is light gray gravelly loam.

Included in this unit are about 5 percent Hades silt loam, 3 to 6 percent slopes, in concave areas; 5 percent Dennot very gravelly loam, 4 to 15 percent slopes, on alluvial fans near the mouth of drainageways; 3 percent Thatcher silt loam, warm, 1 to 3 percent slopes; and 2 percent Thatcher silt loam, warm, 6 to 10 percent slopes. The Thatcher soils are intermingled throughout the unit.

Permeability of this Thatcher soil is moderately slow. Available water capacity is about 10 to 11 inches. Water supplying capacity is 9 to 11 inches. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is slight.

This unit is used mainly for irrigated and nonirrigated crops and as homesites. Some areas are used as rangeland and for wildlife habitat.

This unit is well suited to irrigated and nonirrigated crops. It is limited mainly by the length of the growing season. Crop residue left on or near the surface helps to conserve moisture, maintain tilth, and control erosion. Tillage should be kept to a minimum. If this unit is irrigated, it produces about 4 tons of alfalfa per acre or 75 bushels of barley or wheat per acre. It also produces about 30 bushels of nonirrigated wheat per acre.

This unit is well suited to homesite development. Septic tank filter fields should be placed below the moderately slowly permeable layer. In summer, irrigation is needed for lawn grasses, shrubs, vines, shade trees, and ornamental trees.

The potential plant community on this unit is mainly bluebunch wheatgrass, antelope bitterbrush, Indian ricegrass, and big sagebrush. The suitability of the unit for rangeland seeding is good.

Management practices suitable for use on this unit are proper grazing use and planned grazing systems. Shrubs can be controlled by chemical treatment, mechanical treatment, or prescribed burning.

This map unit is in capability units IIIe-3, irrigated, and IVe-U, nonirrigated. It is in Upland Loam range site.

TBC—Thatcher silt loam, warm, 6 to 10 percent slopes. This very deep, well drained soil is on alluvial fans and toe slopes around Bear Lake. It formed in alluvium and colluvium derived dominantly from

sandstone, limestone, and quartzite. Slopes are long and convex or concave. The present vegetation is mainly big sagebrush, bluebunch wheatgrass, lanceleaf yellowbrush, and antelope bitterbrush. Elevation is 5,940 to 6,700 feet. The average annual precipitation is about 12 to 16 inches, the mean annual air temperature is 40 to 44 degrees F, and the average freeze-free season is 80 to 90 days.

Typically, the surface layer is very dark grayish brown and brown silt loam about 12 inches thick. The subsoil is brown silty clay loam about 17 inches thick. The substratum to a depth of 60 inches or more is white silt loam.

Included in this unit are about 3 percent Dennot very gravelly loam, 4 to 15 percent slopes, on alluvial fans at the mouth of canyons; 3 percent Hades silt loam, 3 to 6 percent slopes, in concave areas; 3 percent Ant Flat silt loam, dry, 10 to 25 percent slopes, on hilly toe slopes; and 1 percent Thatcher silt loam, warm, 3 to 6 percent slopes, in the more gently sloping areas.

Permeability of this Thatcher soil is moderately slow. Available water capacity is about 10 to 11 inches. Water supplying capacity is 8 to 11 inches. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used for irrigated and nonirrigated crops, as rangeland, and for homesite development and wildlife habitat.

This unit is well suited to irrigated and nonirrigated crops. It is limited mainly by the length of the growing season. Crop residue left on or near the surface helps to conserve moisture, maintain tilth, and control erosion. Tillage should be kept to a minimum. If this unit is irrigated, it produces about 4 tons of alfalfa per acre, 70 bushels of barley per acre, or 60 bushels of wheat per acre. The unit also produces about 30 bushels of nonirrigated wheat per acre.

The potential plant community on this unit is mainly bluebunch wheatgrass, antelope bitterbrush, Indian ricegrass, and big sagebrush. The suitability of the unit for rangeland seeding is good.

Management practices suitable for use on this unit are proper grazing use and planned grazing systems. Shrubs can be controlled by chemical treatment, mechanical treatment, or prescribed burning.

If this unit is used for homesite development, the main limitation is steepness of slope.

This map unit is in capability units IVe-3, irrigated, and IVe-U, nonirrigated. It is in Upland Loam range site.

TBD—Thatcher silt loam, warm, 10 to 25 percent slopes. This very deep, well drained soil is on toe slopes around Bear Lake. It formed in alluvium derived dominantly from conglomerate and sandstone. Slopes are long and concave or convex. The present vegetation is mainly big sagebrush, bluebunch wheatgrass, and lanceleaf yellowbrush. Elevation is 6,000 to 6,800 feet. The average annual precipitation is about 12 to 16 inches, the mean annual air temperature is 40 to 44 degrees F, and the average freeze-free season is 80 to 90 days.

Typically, the surface layer is very dark grayish brown and dark brown silt loam about 10 inches thick. The subsoil is brown silty clay loam about 12 inches thick. The substratum to a depth of 60 inches or more is light brown silt loam.

Included in this unit are about 5 percent Dennot very gravelly loam, 4 to 15 percent slopes, on alluvial fans at the mouth of canyons and 5 percent Vanni loam, 10 to 30 percent slopes, in the slightly higher lying areas where toe slopes and foothills meet.

Permeability of this Thatcher soil is moderately slow. Available water capacity is about 9 to 10 inches. Water supplying capacity is 8 to 11 inches. Effective rooting depth is 60 inches or more. Runoff is rapid, and the hazard of water erosion is high.

This unit is used mainly as rangeland and for wildlife habitat. Some areas are used for irrigated and nonirrigated crops and for homesite development.

The potential plant community on this unit is mainly bluebunch wheatgrass, antelope bitterbrush, Indian ricegrass, and big sagebrush. The suitability of the unit for rangeland seeding is poor. The main limitation is slope.

Management practices suitable for use on this unit are proper grazing use and planned grazing systems. Shrubs can be controlled by chemical treatment, mechanical treatment, or prescribed burning.

If this unit is used for irrigated and nonirrigated crops, the main limitations are steepness of slope and length of the growing season. Seedbed preparation should be on the contour or across the slope where practical. Maintaining crop residue on or near the surface reduces runoff, reduces soil blowing, and helps to maintain soil tilth and organic matter content. Tillage should be kept to a minimum.

If this unit is used for homesite development, the main limitation is steepness of slope. Slope is a concern in installing septic tank absorption fields. Absorption lines should be installed on the contour and below the moderately slowly permeable layer.

This map unit is in capability units VIe-3, irrigated, and VIe-U, nonirrigated. It is in Upland Loam range site.

VAE—Vanni loam, 10 to 30 percent slopes. This very deep, well drained soil is on foothills in the vicinity of Round Valley and Garden City and on ridges west of Woodruff. It formed in colluvium derived dominantly from limestone and sandstone. Slopes are long and concave or convex. The present vegetation is mainly big sagebrush, low sagebrush, bluebunch wheatgrass, and mountain snowberry. Elevation is 6,000 to 8,000 feet. The average annual precipitation is about 13 to 17 inches, the mean annual air temperature is 35 to 42

degrees F, and the average freeze-free season is 50 to 85 days.

Typically, the surface layer is brown loam about 7 inches thick. The subsoil is light yellowish brown loam about 4 inches thick. The substratum to a depth of 60 inches or more is very pale brown and white loam.

Included in this unit are about 8 percent soils that are similar to this Vanni soil but are free of carbonates in the upper 4 inches; 5 percent Kearl loam, 15 to 25 percent slopes; and 5 percent Thatcher silt loam, warm, 10 to 25 percent slopes. These included soils are intermingled throughout the unit.

Permeability of this Vanni soil is moderate. Available water capacity is about 8.5 to 10.0 inches. Water supplying capacity is 8 to 13 inches. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate.

Most areas of this unit are used as rangeland and for wildlife habitat. A few areas are used for homesite development.

The potential plant community on this unit is mainly bluebunch wheatgrass, black sagebrush, muttongrass, and antelope bitterbrush. The suitability of the unit for rangeland seeding is poor. The main limitation is steepness of slope.

Management practices suitable for use on this unit are proper grazing use and planned grazing systems. Shrubs can be controlled by chemical treatment, mechanical treatment, or prescribed burning.

Population growth has resulted in increased construction of homes on the soil in this unit. The main limitation for use as homesites is steepness of slope. Preserving the existing plant cover during construction helps to control erosion.

Effluent from septic tank absorption fields can surface in downslope areas and thus create a hazard to health. Absorption lines should be installed on the contour.

This map unit is in capability unit VIe-U4, nonirrigated, and in Upland Loam range site.

VAF—Vanni loam, 30 to 50 percent slopes. This very deep, well drained soil is on foothills in the northwestern part of the survey area, near Round Valley, and on ridges west of Woodruff. It formed in colluvium derived dominantly from limestone and sandstone. Slopes are long and convex. The present vegetation is mainly big sagebrush, low sagebrush, bluebunch wheatgrass, and Utah serviceberry. Elevation is 6,000 to 7,000 feet. The average annual precipitation is about 13 to 15 inches, the mean annual air temperature is 38 to 42 degrees F, and the average freeze-free season is 65 to 85 days.

Typically, the surface layer is dark brown loam about 7 inches thick. The subsoil is brown gravelly loam about 6 inches thick. The substratum to a depth of 60 inches or more is brown loam.

Included in this unit are about 6 percent Jebo very gravelly loam, 25 to 40 percent slopes, intermingled throughout the unit; 3 percent Kearl loam, 25 to 40 percent slopes, on ridgetops; and 6 percent Lundy very gravelly loam that is dry, has slopes of 25 to 60 percent, and is under stands of juniper.

Permeability of this Vanni soil is moderate. Available water capacity is about 9 to 10 inches. Water supplying capacity is 8 to 11 inches. Effective rooting depth is 60 inches or more. Runoff is rapid, and the hazard of water erosion is high.

Most areas of this unit are used as rangeland and for wildlife habitat. A few areas are used for homesite development.

The potential plant community on this unit is mainly bluebunch wheatgrass, black sagebrush, muttongrass, and antelope bitterbrush. The suitability of the unit for rangeland seeding is very poor. The main limitation is slope.

Management practices that maintain or improve the range vegetation include proper grazing use, planned grazing systems, fencing, and stock water developments. Shrubs can be controlled by chemical treatment.

Population growth has resulted in increased construction of homes on the soil in this unit. The main limitation for use as homesites is steepness of slope. Preserving the existing plant cover during construction helps to control erosion.

Effluent from septic tank absorption fields can surface in downslope areas and thus create a hazard to health. Absorption lines should be installed on the contour.

This map unit is in capability unit VIIe-U4, nonirrigated, and in Upland Loam range site.

VBF—Vanni very stony loam, 40 to 60 percent slopes. This very deep, well drained soil is on foothills in canyons east of Bear Lake. It formed in colluvium and residuum derived dominantly from sandstone, shale, and limestone. Slopes are long and are convex or concave. They face east, south, and west. The present vegetation is mainly Utah juniper, big sagebrush, bluebunch wheatgrass, and Indian ricegrass. Elevation is 6,000 to 7,100 feet. The average annual precipitation is about 13 to 16 inches, the mean annual air temperature is 38 to 42 degrees F, and the average freeze-free season is 70 to 85 days.

Typically, 50 to 90 percent of the surface is covered with rock fragments. The surface layer is dark brown very stony loam 7 inches thick. The upper 48 inches of the underlying material is pale brown gravelly silt loam, and the lower part to a depth of 60 inches or more is yellowish brown gravelly loam.

Included in this unit are about 8 percent Vanni loam, 30 to 50 percent slopes, intermingled throughout the unit; 4 percent Ellett silt loam, 10 to 30 percent slopes, on toe slopes; 2 percent Kearl loam, 25 to 40 percent slopes, on ridgetops; and 1 percent Lundy very gravelly

loam, on ridgetops, that is dry and has slopes of 25 to 60 percent.

Permeability of this Vanni soil is moderate. Available water capacity is about 7.0 to 8.5 inches. Water supplying capacity is 8 to 11 inches. Effective rooting depth is 60 inches or more. Runoff is rapid, and the hazard of water erosion is high.

This unit is woodland, but it is used primarily for livestock grazing and wildlife habitat.

This unit is well suited to Utah juniper. The site index for Utah juniper is 55. The unit can produce 9.5 cords per acre in a stand of trees that average 5 inches in diameter at a height of 1 foot.

The potential plant community on this unit is bluebunch wheatgrass, big sagebrush, and western wheatgrass.

Management practices that maintain or improve the range vegetation include proper grazing use, planned grazing systems, fencing, and stock water developments.

This map unit is in capability unit VIIe-U4J, nonirrigated, and in woodland suitability group 2r2.

VCD—Vicking silt loam, dry, 4 to 15 percent slopes. This very deep, well drained soil is on alluvial fans near Rex Peak, in the Crawford Mountains. It formed in alluvium derived dominantly from limestone. Slopes are long and convex or concave. The present vegetation is mainly big sagebrush, western wheatgrass, Sandberg bluegrass, serviceberry, and lanceleaf yellowbrush. Elevation is 7,000 to 7,500 feet. The average annual precipitation is about 13 to 15 inches, the mean annual air temperature is 36 to 40 degrees F, and the average freeze-free season is 50 to 70 days.

Typically, the surface layer is very dark grayish brown silt loam about 5 inches thick. The subsoil is dark brown silty clay loam about 19 inches thick. The substratum to a depth of 60 inches or more is very pale brown gravelly loam and very gravelly loam. A layer of secondary calcium carbonate accumulation is at a depth of about 24 inches.

Included in this unit are about 3 percent Agassiz stony loam that has slopes of 25 to 60 percent and is on south-facing side slopes; 2 percent Fontreen gravelly silt loam that has slopes of 10 to 40 percent and is on ridges; and 2 percent Rexmont gravelly loam that has slopes of 6 to 20 percent and is on ridges.

Permeability of this Vicking soil is slow. Available water capacity is about 7.5 to 8.5 inches. Water supplying capacity is 9 to 10 inches. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used as rangeland and for wildlife habitat.

The potential plant community on this unit is mainly bluebunch wheatgrass, antelope bitterbrush, Indian ricegrass, and big sagebrush. The suitability of the unit for rangeland seeding is good.

Management practices suitable for use on this unit are proper grazing use and planned grazing systems. Shrubs can be controlled by chemical treatment, mechanical treatment, or prescribed burning.

This map unit is in capability unit VIe-U4, nonirrigated, and in Upland Loam range site.

WA—Wader loam. This very deep, poorly drained soil is on flood plains of the Bear River. It formed in alluvium derived from mixed parent material. Slopes are 0 to 2 percent and are undulating. They are medium in length and are plane to slightly convex or concave. The present vegetation is mainly broadleaf sedges, wire grass, foxtail, and tufted hairgrass. Elevation is 6,200 to 6,400 feet. The average annual precipitation is about 9 to 11 inches. The mean annual air temperature is 38 to 42 degrees F, and the average freeze-free season is 55 to 65 days.

Typically, the surface layer is very dark gray loam about 7 inches thick. The upper 29 inches of the underlying material is dark brown loam and fine sandy loam, and the lower part to a depth of 60 inches or more is dark grayish brown sand.

Included in this unit are about 6 percent Bear Lake silt loam, intermingled throughout the unit; 4 percent Saleratus loam, intermingled throughout the unit; 3 percent Wader loam, saline-alkali, in slightly convex areas; and 3 percent Bear Lake silt loam, ponded, in old stream channels and oxbows. Also included are small areas of a soil that is similar to this Wader soil but is somewhat poorly drained or moderately well drained. Included areas make up about 18 percent of the total acreage.

Permeability of this Wader soil is moderate. Available water capacity is about 6.0 to 7.5 inches. Effective rooting depth is limited by a seasonal high water table that is at a depth of 18 to 30 inches from May to July. Runoff is very slow. This soil is subject to frequent periods of flooding in spring.

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

This unit is well suited to hay and pasture. If drainage is not provided, plants that tolerate a seasonal high water table should be selected. If this unit is irrigated, it produces about 6 animal-unit-months of forage per acre.

The potential plant community on this unit is mainly sedges, slender wheatgrass, basin wildrye, and tufted hairgrass. The suitability of the unit for rangeland seeding is good. Management practices suitable for use on this unit are proper grazing use and planned grazing systems.

This map unit is in capability unit IVw-4, irrigated, and in Semiwet Meadow range site.

WB—Wader loam, saline-alkali. This very deep, poorly drained soil is on flood plains of the Bear River. It formed in alluvium derived from mixed parent material. Slopes are 0 to 2 percent and are undulating. They are

medium to long. The present vegetation is mainly saltgrass, foxtail, wiregrass, and greasewood. Elevation is 6,200 to 6,400 feet. The average annual precipitation is about 9 to 11 inches, the mean annual air temperature is 38 to 42 degrees F, and the average freeze-free season is 55 to 65 days.

Typically, the surface layer is very dark grayish brown loam about 11 inches thick. The upper 35 inches of the underlying material is dark grayish brown and brown loam and silt loam, and the lower part to a depth of 60 inches or more is dark yellowish brown coarse sand.

Included in this unit are about 5 percent Nevka loam in the slightly higher lying areas; 3 percent Bear Lake silty clay loam, saline-alkali, intermingled throughout the unit; 2 percent Bear Lake silt loam, ponded, in old stream channels and oxbows; and 2 percent Wader loam in slightly concave areas.

Permeability of this Wader soil is moderate. Available water capacity is about 7.5 to 9.0 inches. Effective rooting depth is limited by a seasonal high water table that is at a depth of 24 to 36 inches from May to July. Runoff is slow. This soil is subject to frequent periods of flooding in spring.

This unit is used for irrigated hay and pasture, as rangeland, and for wildlife habitat.

This unit is poorly suited to irrigated hay and pasture. The concentration of salts and alkali in the surface layer limits the production of plants suitable for hay and pasture. Leaching the salts from the surface layer is limited by the high water table; however, drainage and irrigation water management reduce the concentration of salts. Salt-tolerant species are most suitable for planting. If this unit is irrigated, it produces about 5 animal-unit-months of forage per acre.

The potential plant community on this unit is mainly saltgrass, alkali sacaton, alkali bluegrass, and basin wildrye. The suitability of the unit for rangeland seeding is very poor. The main limitation is the content of salt and alkali in the soil. Managemant practices suitable for use on this unit are proper grazing use and planned grazing systems.

This map unit is in capability units IVw-48, irrigated, and VIIw-A, nonirrigated. It is in Alkali Bottoms range site.

WC—Wader Variant gravelly loam. This very deep, poorly drained soil is on lake terraces and flood plains. It is on the shores of Bear Lake and on the Bear River flood plain. The soil formed in alluvium derived dominantly from sandstone, limestone, and quartzite. Slopes are 0 to 2 percent and are undulating. The present vegetation is mainly broadleaf sedges, bluegrass, foxtail, and wiregrass. Elevation is 5,930 to 6,300 feet. The average annual precipitation is about 9 to 14 inches, the mean annual air temperature is 38 to 44 degrees F, and the average freeze-free season is 55 to 90 days.

Typically, the surface layer is black gravelly loam about 8 inches thick. The upper 4 inches of the underlying material is very dark grayish brown very gravelly sandy loam, and the lower part to a depth of 60 inches or more is grayish brown and pale brown very gravelly loamy sand.

Included in this unit are about 10 percent Wader loam along stream channels; 7 percent soils, in the slightly higher lying areas and on old terraces, that are sandy, very gravelly, and well drained; 3 percent Canburn Variant loamy sand that has slopes of 0 to 2 percent and is in concave areas surrounding Bear Lake; and 3 percent Saleratus Variant loamy fine sand that has slopes of 0 to 2 percent and is in areas surrounding Bear Lake. Also included are small areas of Canburn silt loam in shallow depressional areas. Included areas make up about 25 percent of the total acreage.

Permeability of this Wader Variant soil is rapid. Available water capacity is about 2.5 to 4.0 inches. Effective rooting depth is limited by a seasonal high water table that is at a depth of 12 to 30 inches from May to July. Runoff is very slow. This soil is subject to rare periods of flooding.

Most areas of this unit are used as rangeland and for irrigated hay and pasture. A few areas are used for homesite development.

The potential plant community on this unit is mainly tufted hairgrass, Baltic rush, Nebraska sedge and other sedges, and meadow foxtail. The suitability of the unit for rangeland seeding is fair. The main limitations are low available water capacity and rock fragments in the surface layer. Management practices suitable for use on this unit are proper grazing use and planned grazing systems.

If this unit is used for irrigated hay and pasture, the main limitations are the high water table and a short growing season. If drainage is not provided, plants that tolerate a seasonal high water table should be selected. If this unit is irrigated, it produces about 5 animal-unit-months of forage per acre.

If this unit is used for homesite development, the main limitations are the high water table and the hazard of flooding. Drainage is needed if roads and building foundations are constructed.

This map unit is in capability units Vw-4, irrigated and nonirrigated. It is in Wet Meadows range site.

WDC—Woodpass loam, 2 to 8 percent slopes. This very deep, well drained soil is on alluvial fans and uplands along the foot of the Crawford Mountains and south of Neponset Lake. It formed in alluvium derived from sandstone and some limestone. Slopes are long and slightly convex. They dominantly face north and east. The present vegetation is mainly big sagebrush, bluebunch wheatgrass, lanceleaf yellowbrush, and Hood phlox. Elevation is 6,300 to 6,900 feet. The average annual precipitation is about 10 to 13 inches, the mean

annual air temperature is 38 to 41 degrees F, and the average freeze-free season is 60 to 70 days.

Typically, the surface layer is brown loam 11 inches thick. The subsoil is light brown loam 9 inches thick. The substratum to a depth of 60 inches or more is pink and pinkish white loam.

Included in this unit are about 12 percent Pancheri silt loam, cool, 1 to 5 percent slopes, intermingled throughout the unit and 6 percent Zagg clay loam that has slopes of 2 to 8 percent and is near the bottom of drainageways. Also included is about 2 percent Neponset sandy loam, 6 to 10 percent slopes, on broad convex ridges.

Permeability of this Woodpass soil is moderately slow. Available water capacity is about 9 to 10 inches. Water supplying capacity is 6 to 10 inches. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used as rangeland and for wildlife habitat.

The potential plant community on this unit is mainly bluebunch wheatgrass, needleandthread, big sagebrush, and bottlebrush squirreltail. The suitability of the unit for rangeland seeding is fair. The main limitation is low precipitation.

Management practices suitable for use on this unit are proper grazing use and planned grazing systems. Shrubs can be controlled by chemical treatment, mechanical treatment, or prescribed burning.

This map unit is in capability unit VIe-S, nonirrigated, and in Semidesert Loam range site.

YAE—Yeates Hollow gravelly loam, 25 to 40 percent slopes. This deep, well drained soil is on mountainsides in Cottonwood Canyon, south of Round Valley. It formed in residuum and colluvium derived dominantly from sandstone and conglomerate. Slopes are long and convex or concave. They face south. The present vegetation is mainly big sagebrush, antelope bitterbrush, bluebunch wheatgrass, lanceleaf yellowbrush, serviceberry, and basin wildrye. Elevation is 6,500 to 7,800 feet. The average annual precipitation is about 20 to 25 inches, the mean annual air temperature is 36 to 42 degrees F, and the average freeze-free season is 60 to 70 days.

Typically, the surface layer is dark brown gravelly loam about 10 inches thick. The upper 5 inches of the subsoil is dark brown gravelly clay loam, and the lower 7 inches is yellowish red very gravelly clay loam. The substratum is red very gravelly clay loam about 30 inches thick. Sandstone is at a depth of 52 inches. A layer of secondary calcium carbonate accumulation is at a depth of about 22 inches. Depth to bedrock ranges from 40 to 60 inches.

Included in this unit are about 10 percent Dagan gravelly loam, moist, 25 to 40 percent slopes, intermingled throughout the unit; 5 percent soils, intermingled throughout the unit, that are similar to this Yeates Hollow soil but are less than 40 inches deep to bedrock; and 5 percent Obray silty clay loam that has slopes of 6 to 25 percent and is in the more gently sloping areas.

Permeability of this Yeates Hollow soil is slow. Available water capacity is about 5.0 to 7.5 inches. Water supplying capacity is 11 to 13 inches. Effective rooting depth is 40 to 60 inches. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used as rangeland and for wildlife habitat.

The potential plant community on this unit is bluebunch wheatgrass, Nevada bluegrass, birchleaf mountainmahogany, and muttongrass. The suitability of the unit for rangeland seeding is poor. The main limitations are the content of rock fragments in the surface layer and steepness of slope.

Management practices suitable for use on this unit are proper grazing use and planned grazing systems. Shrubs can be controlled by chemical treatment.

This map unit is in capability unit VIe-M4, nonirrigated, and in Mountain Gravelly Loam range site.

YBD—Yeates Hollow-Obray complex, 6 to 25 percent slopes. This map unit is on foothills and alluvial fans west and south of Bear Lake. The present vegetation is mainly big sagebrush, serviceberry, bluebunch wheatgrass, snowberry, and muleseardock. Elevation is 6,300 to 7,300 feet. The average annual precipitation is about 18 to 20 inches, the mean annual air temperature is 38 to 43 degrees F, and the average freeze-free season is 65 to 80 days.

This unit is 40 percent Yeates Hollow stony loam and 40 percent Obray silty clay loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are about 14 percent Cloud Rim loam that is dry, has slopes of 4 to 15 percent, and is in the slightly lower lying areas; 4 percent Ant Flat silt loam, dry, 10 to 25 percent slopes, in the slightly lower lying areas; and 2 percent Lucky Star gravelly loam, 8 to 25 percent slopes, that is on north-facing side slopes and is under stands of aspen.

The Yeates Hollow soil is very deep and well drained. It formed in alluvium and colluvium derived dominantly from quartzite, sandstone, and conglomerate. Slopes are long and convex or concave. Typically, the surface layer is very dark brown stony loam 12 inches thick. The subsoil is dark brown very gravelly clay loam 47 inches thick. The substratum to a depth of 72 inches or more is yellowish red and strong brown extremely gravelly loam.

Permeability of the Yeates Hollow soil is slow. Available water capacity is about 5 to 7 inches. Water supplying capacity is 10 to 12 inches. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate.

The Obray soil is very deep and well drained. It formed in colluvium and alluvium derived dominantly from

sandstone and shale. Slopes are long and convex and concave. Typically, the surface layer is very dark brown silty clay loam 8 inches thick. The upper 49 inches of the underlying material is brown clay, and the lower part to a depth of 60 inches or more is brown gravelly clay.

Permeability of the Obray soil is very slow. Available water capacity is about 10 to 11 inches. Water supplying capacity is 13 to 16 inches. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used mainly as rangeland and for wildlife habitat. It is also used for homesite development.

The potential plant community on the Yeates Hollow soil is mainly bluebunch wheatgrass, Nevada bluegrass, arrowleaf balsamroot, and antelope bitterbrush. The potential plant community on the Obray soil is mainly bluebunch wheatgrass, slender wheatgrass, Idaho fescue, and antelope bitterbrush. The suitability of this unit for rangeland seeding is fair. The main limitations are steepness of slope and rock fragments in the surface layer of the Yeates Hollow soil.

Management practices suitable for use on this unit are proper grazing use and planned grazing systems. Shrubs can be controlled by chemical treatment, mechanical treatment, or prescribed burning.

Population growth has resulted in increased construction of homes on this unit. The main limitations for use of this unit as homesites are steepness of slope, slow permeability, low soil strength, and potential for shrinking and swelling. Buildings and roads should be designed to offset the limited ability of the soils in the unit to support a load. The effects of shrinking and swelling can be minimized by using proper engineering designs and by backfilling with material that has low shrink-swell potential.

Slope is a concern in installing septic tank absorption fields. Absorption lines should be installed on the contour. The slow permeability of the Yeates Hollow soil and the very slow permeability of the Obray soil can be overcome by increasing the size of the absorption field.

This map unit is in capability unit VIe-M4, nonirrigated. The Yeates Hollow soil is in Mountain Gravelly Loam range site, and the Obray soil is in Mountain Clay range site.

YCD—Yeljack loam, 6 to 25 percent slopes. This very deep, well drained soil is on mountainsides and broad summits in the southwestern part of the survey area. It formed in colluvium derived dominantly from sandstone. Slopes are long and slightly convex. The present vegetation is mainly big sagebrush, lanceleaf yellowbrush, mountain snowberry, and Letterman needlegrass. Elevation is 6,850 to 8,700 feet. The average annual precipitation is about 25 to 34 inches, the mean annual air temperature is 32 to 38 degrees F, and the average freeze-free season is 35 to 70 days.

Typically, the surface layer is dark brown loam about 30 inches thick. The subsoil to a depth of about 60 inches or more is yellowish red clay loam.

Included in this unit are about 6 percent St. Marys loam that has slopes of 10 to 40 percent and is intermingled throughout the unit; 4 percent Ercan loam, 3 to 15 percent slopes, under aspen; and 3 percent Yeljack loam that dominantly is on north-facing side slopes, has slopes of 10 to 30 percent, and is under aspen. Also included is 2 percent Condie gravelly loam, 6 to 25 percent slopes, that is on north- and east-facing side slopes and is under conifers.

Permeability of this Yeljack soil is moderately slow. Available water capacity is about 8.0 to 10.5 inches. Water supplying capacity is 16 to 25 inches. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used as rangeland and for wildlife habitat.

The potential plant community on this unit is mainly slender wheatgrass, basin wildrye, mountain brome, and bearded wheatgrass. The suitability of the unit for rangeland seeding is good.

Management practices suitable for use on this unit are proper grazing use and planned grazing systems. Shrubs can be controlled by chemical treatment, mechanical treatment, or prescribed burning.

This map unit is in capability unit VIe-H, nonirrigated, and in High Mountain Loam range site.

YDE—Yeljack loam, north, 10 to 30 percent slopes. This very deep, well drained soil is on mountainsides in the southwestern part of the survey area. It formed in colluvium derived dominantly from sandstone. Slopes are long and slightly convex. They are dominantly north-facing below an elevation of 8,000 feet, and they face all directions above that elevation. The present vegetation is mainly quaking aspen with an understory of aspen peavine, blue wildyre, mountain brome, and antelope bitterbrush. Elevation is 7,300 to 8,500 feet. The average annual precipitation is about 28 to 34 inches, the mean annual air temperature is 32 to 34 degrees F, and the average freeze-free season is 35 to 60 days.

Typically, the surface is covered with a mat of leaves and decayed organic material about 2 inches thick. The upper 26 inches of the surface layer is dark brown loam, and the lower 11 inches is yellowish brown fine sandy loam. The subsoil to a depth of 60 inches or more is brown gravelly clay loam.

Included in this unit are about 5 percent Lucky Star gravelly loam, 8 to 25 percent slopes, intermingled throughout the unit; 5 percent Yeljack loam, 6 to 25 percent slopes, under shrubs and grasses; 3 percent Ercan loam, 15 to 30 percent slopes, intermingled throughout the unit; and 2 percent St. Marys loam, 10 to 40 percent slopes, under shrubs and grasses.

Permeability of this Yeljack soil is moderately slow. Available water capacity is about 8 to 10 inches. Water

supplying capacity is 15 to 21 inches. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate.

This unit is woodland, but it is used primarily as rangeland and for wildlife habitat.

This unit is well suited to the production of aspen. The site index for aspen is 64. The unit can produce about 3,300 cubic feet, or 2,200 board feet (International rule), of merchantable timber per acre from an even-aged, fully stocked stand of trees 100 years old.

The potential understory plant community on this unit is mainly mountain brome, dryland sedges, blue wildrye, and snowberry.

Management practices suitable for use on this unit are proper grazing use and planned grazing systems.

This map unit is in capability unit VIe-HA, nonirrigated, and in woodland suitability group 3o2.

YEE—Yeljack-Cluff complex, 10 to 40 percent slopes. This map unit is on hilly to steep mountain ridges in the southwestern part of Rich County. Elevation is 7,800 to 8,900 feet. The average annual precipitation is about 25 to 35 inches, the mean annual air temperature is 32 to 36 degrees F, and the average freeze-free season is 40 to 55 days.

This unit is 50 percent Yeljack loam, north, 10 to 30 percent slopes, and 40 percent Cluff gravelly loam, 10 to 40 percent slopes. The Yeljack soil is under aspen, and the Cluff soil dominantly is under conifers. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit is about 5 percent soils that are similar to this Yeljack soil but have a subsoil that is coarser textured than sandy clay loam. Also included is about 5 percent Yeljack loam, 6 to 25 percent slopes, that supports grasses and sagebrush.

The Yeljack soil is very deep and well drained. It formed in colluvium derived dominantly from sandstone. Slopes are long and convex or concave. They dominantly face north below an elevation of 8,000 feet, and they face all directions above that elevation. The present vegetation is mainly quaking aspen, aspen peavine, and blue wildrye.

Typically, the upper 14 inches of the surface layer is dark grayish brown loam, and the lower 18 inches is dark brown fine sandy loam. The subsoil to a depth of 60 inches or more is yellowish red sandy clay loam.

Permeability of the Yeljack soil is moderately slow. Available water capacity is about 8 to 10 inches. Water supplying capacity is 13 to 18 inches. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate.

The Cluff soil is deep and well drained. It formed in colluvium and residuum derived dominantly from sandstone. Slopes are long and convex or concave. The present vegetation is mainly aspen, Engelmann spruce, and blue wildrye.

Typically, the upper 4 inches of the surface layer is dark brown gravelly loam, and the lower 10 inches is dark yellowish brown very gravelly loam. The subsurface layer is brown extremely gravelly sandy clay loam 6 inches thick. The subsoil is yellowish red extremely gravelly clay loam 20 inches thick. Sandstone is at a depth of 40 inches. Depth to bedrock ranges from 40 to 60 inches.

Permeability of the Cluff soil is moderately slow. Available water capacity is about 5 to 7 inches. Water supplying capacity is 12 to 15 inches. Effective rooting depth is 40 to 60 inches. Runoff is slow, and the hazard of water erosion is slight.

This unit is used as woodland and for wildlife habitat.

Management practices and capability classification are not provided for this unit (all in National Forest).

ZAD—Zagg complex, 2 to 15 percent slopes. This map unit is on rolling uplands in the southern part of the survey area. Slopes are medium to long and are convex or concave. They dominantly face south and southwest. The present vegetation is mainly Nuttall saltbush, western wheatgrass, Indian ricegrass, and low sagebrush. Elevation is 6,400 to 6,800 feet. The average annual precipitation is about 9 to 12 inches, the mean annual air temperature is 38 to 42 degrees F, and the average freeze-free season is 55 to 75 days.

This unit is 40 percent Zagg gravelly clay loam, 4 to 15 percent slopes, and 35 percent Zagg clay loam, 2 to 8 percent slopes. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are about 10 percent Woodpass loam, 2 to 8 percent slopes, on ridgetops; 8 percent Zegro silty clay loam, 2 to 5 percent slopes, in slightly concave areas; and 4 percent fine textured, well drained soils that are moderately deep over shale and are intermingled throughout the unit. Also included is 3 percent Alhark loam, 6 to 15 percent slopes, on ridgetops.

The Zagg gravelly clay loam is very deep and well drained. It formed in alluvium and colluvium derived dominantly from siltstone and shale. Typically, the surface layer is brown gravelly clay loam 3 inches thick. The upper 15 inches of the underlying material is light grayish brown and light gray silty clay loam, and the lower part to a depth of 60 inches or more is light gray silty clay.

Permeability of the Zagg gravelly clay loam is slow. Available water capacity is about 10 to 11 inches. Water supplying capacity is 6 to 9 inches. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate.

The Zagg clay loam is very deep and well drained. It formed in alluvium and colluvium derived dominantly

from siltstone and shale. Typically, the surface layer is grayish brown clay loam 9 inches thick. The underlying material to a depth of 60 inches or more is light brownish gray clay loam.

Permeability of the Zagg clay loam is slow. Available water capacity is about 10 to 11 inches. Water supplying capacity is 6 to 9 inches. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used as rangeland and for wildlife habitat.

The potential plant community on this unit is Nuttall saltbush, winterfat, western wheatgrass, and Indian ricegrass. The suitability of this unit for rangeland seeding is fair. The main limitation is low precipitation.

Management practices suitable for use on this unit are proper grazing use and planned grazing systems.

This map unit is in capability unit VIe-S5, and in Semidesert Clay range site.

ZBC—Zegro silty clay loam, 2 to 5 percent slopes. This moderately deep, well drained soil is on foothills, mostly in the southeastern part of Rich County. It formed in residuum and alluvium derived dominantly from siltstone and shale. Slopes are medium to long and are slightly convex. The present vegetation is mainly lanceleaf yellowbrush, black sagebrush, western wheatgrass, and bottlebrush squirreltail. Elevation is 6,400 to 7,000 feet. The average annual precipitation is about 10 to 13 inches, the mean annual air temperature is 38 to 40 degrees F, and the average freeze-free season is 60 to 75 days.

Typically, the surface layer is light reddish brown silty clay loam about 8 inches thick. The underlying material is stratified reddish yellow and white silty clay loam about 29 inches thick. Soft shale is at a depth of 37 inches. Depth to shale ranges from 20 to 40 inches.

Included in this unit are about 8 percent Zagg clay loam that has slopes of 2 to 8 percent and is intermingled throughout the lower lying areas of the unit; 4 percent Woodpass loam, 2 to 8 percent slopes, on north- and east-facing side slopes; 2 percent Neponset sandy loam, 6 to 10 percent slopes, on ridgetops; and 1 percent Lariat fine sandy loam, 4 to 10 percent slopes, on ridgetops.

Permeability of this Zegro soil is slow. Available water capacity is about 6 to 7 inches. Water supplying capacity is 7 to 8.5 inches. Effective rooting depth is 20 to 40 inches. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used as rangeland and for wildlife habitat.

The potential plant community on this unit is mainly Nuttall saltbush, winterfat, western wheatgrass, and Indian ricegrass. The suitability of this unit for rangeland seeding is fair. The main limitations are depth to bedrock and low precipitation.

Management practices suitable for use on this unit are proper grazing use and planned grazing systems.

This map unit is in capability unit VIe-S3, nonirrigated, and in Semidesert Clay range site.

ZCD—Zegro-Zagg complex, 2 to 15 percent slopes. This map unit is on rolling uplands, mainly in the southeastern part of Rich County. The present vegetation is mainly lanceleaf yellowbrush, western wheatgrass, and bottlebrush squirreltail. Elevation is 6,400 to 7,000 feet. The average annual precipitation is about 10 to 13 inches, the mean annual air temperature is 38 to 40 degrees F, and the average freeze-free season is 60 to 75 days.

This unit is 45 percent Zegro silty clay loam, 5 to 15 percent slopes, and 35 percent Zagg silty clay loam, 2 to 5 percent slopes. The Zegro soil is in the slightly convex areas, and the Zagg soil is in the slightly concave areas. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are about 8 percent Woodpass loam, 2 to 8 percent slopes, on north- and east-facing side slopes; 7 percent Neponset sandy loam, 6 to 10 percent slopes, on ridgetops; and 5 percent Rock outcrop on moderately steep side slopes and hilltops.

The Zegro soil is moderately deep and well drained. It formed in residuum and alluvium derived dominantly from siltstone and shale. Slopes are medium to long and are convex. Typically, the surface layer is light reddish brown silty clay loam 8 inches thick. The underlying material is stratified reddish yellow and white silty clay loam 29 inches thick. Soft siltstone is at a depth of about 37 inches. Depth to siltstone ranges from 20 to 40 inches.

Permeability of the Zegro soil is slow. Available water capacity is about 6 to 7 inches. Water supplying capacity is 7.0 to 8.5 inches. Effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high.

The Zagg soil is very deep and well drained. It formed in alluvium derived dominantly from siltstone and shale. Slopes are medium to long and are slightly concave. Typically, the surface layer is brown silty clay loam 3 inches thick. The underlying material to a depth of 60 inches or more is grayish brown and light grayish brown silty clay.

Permeability of the Zagg soil is slow. Available water capacity is about 10 to 11 inches. Water supplying capacity is 6 to 9 inches. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used as rangeland and for wildlife habitat.

The potential plant community on this unit is Nuttall saltbush, winterfat, western wheatgrass, and Indian ricegrass. The suitability of the unit for rangeland seeding is fair. The main limitation is depth to bedrock.

Management practices suitable for use on this unit are proper grazing use and planned grazing systems.

This map unit is in capability unit VIe-S3, and in Semidesert Clay range site.

prime farmland

Prime farmland, as defined by the United States Department of Agriculture, is the land that is best suited to producing food, feed, forage, fiber, and oilseed crops. It must either be used for producing food or fiber or be available for these uses. 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 commonly has an adequate and dependable supply of moisture from precipitation or irrigation. It also has a favorable temperature and length of growing season and an acceptable level of acidity or alkalinity. It has few if any rock fragments and is permeable to water and air. Prime farmland is not excessively eroded or saturated with water for long periods and is not flooded during the growing season. The slope is no more than 6 percent.

The following map units meet the requirements for prime farmland when irrigated. This list does not constitute a recommendation for a particular land use.

BFB—Bereniceton silt loam, cool, 1 to 3 percent slopes
BHA—Bockston loam, cool, 0 to 3 percent slopes
BHB—Bockston loam, cool, 3 to 6 percent slopes
CEA—Cowco loam, 0 to 3 percent slopes
CEB—Cowco loam, 3 to 6 percent slopes
DHB—Despain Variant gravelly loam, 1 to 3 percent slopes
DJA—Duckree loam, 0 to 3 percent slopes
PAC—Pancheri silt loam, cool, 1 to 5 percent slopes
TBA—Thatcher silt loam, warm, 1 to 3 percent slopes
TBB—Thatcher silt loam, warm, 3 to 6 percent slopes

use and management of the soils

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

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

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

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

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

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

crops and pasture

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

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

About 48,400 acres in the county is used for irrigated crops and pasture, and about 11,600 acres is used for nonirrigated crops. The irrigated cropland and pastureland are in Bear River Valley and Bear Lake Basin. The milder climate and higher precipitation of Bear Lake Basin make it more favorable for the production of commercial crops than the rest of the county.

The potential for increasing the production of some of the soils presently being farmed is excellent. The use of adapted crop and pasture plants and proper irrigation water management could increase production on about 58,620 acres. This acreage includes soils that have a high water table or are saline or alkaline, or both.

The main irrigated crops in the county are alfalfa, small grain, and raspberries. The most productive soils for these crops are near Garden City and Laketown. A large percentage of small grain and alfalfa is used locally to provide supplemental feed for livestock. Management concerns include timely application of irrigation water and maintenance of soil fertility.

Irrigated pastures consist of native, introduced, and improved grasses. Suitable management practices are seeding of adapted species, proper irrigation water management, and maintenance of soil fertility. The use of proper stocking rates and restricted grazing during wet periods helps to keep pastures in good condition.

Using and distributing irrigation water efficiently and maintaining soil fertility are the main management objectives on the irrigated soils in the county. Use of proper irrigation grades, length of runs, distance between borders, and frequency and duration of irrigation water application should be considered. The irrigation method to be used depends on the type of crop grown, soil characteristics, slope, and the water supply. The application of animal manure and commercial fertilizer is necessary for maintaining soil fertility.

Drainage is needed to increase production on some of the soils used for irrigated crops and pasture. Onsite investigations are necessary to determine the feasibility of draining an area. The selection of adapted plants and proper irrigation water management will increase production of those soils that cannot be drained.

Low precipitation and a short growing season are the main factors limiting the production of nonirrigated crops

in the county. Wheat is the principle nonirrigated crop. The largest acreage of wheat is on the Bear River Plateau, east of Bear Lake.

The main management concerns for nonirrigated crops are conserving soil moisture and controlling erosion. A crop-fallow system, in which crops are grown every other year, should be used because of the limited precipitation. Stubble mulch tillage and incorporation of crop residue in the soil help to control erosion and conserve moisture.

Steeply sloping areas of nonirrigated cropland and moderately to severely eroded areas should be converted to permanent pasture. Maintaining these marginal areas in grass provides better protection from erosion.

yields per acre

The average yields per acre that can be expected of the principal crops under a high level of management is given in the section "Detailed soil map units" for each soil suited to crops. In any given year, yields may be higher or lower than those indicated in the map units because of variations in rainfall and other climatic factors.

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

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

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

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

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

land capability classification

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

In the capability system, soils are generally grouped at three levels: capability class, subclass, and unit. These levels are defined in the following paragraphs.

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

Class I soils have slight limitations that restrict their use.

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

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

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

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

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

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

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

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

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the

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

Capability units are soil groups within a subclass. The soils in a capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity. Capability units are designed by adding a hyphen and numerals and capital letters to the subclass symbol.

Arabic numerals or capital letters in the first position after the hyphen, indicate climatic zone. Numerals are used for irrigated and nonirrigated capability units that are in the *w* subclass. Only numerals 3 and 4 are used in this survey. The numeral 3 indicates that the soils in the map unit have a frost-free season of 70 to 100 days, and the numeral 4 indicates a frost-free season of 50 to 70 days.

The letters *S, U, M,* and *H* in the first position following the hyphen are used for nonirrigated capability units. They indicate the range in average annual precipitation in the different climatic zones. The *S* (Semidesert) indicates 8 to 12 inches of precipitation; *U* (Upland) indicates 12 to 16 inches of precipitation; *M* (Mountain) indicates 16 to 22 inches of precipitation; and *H* (High Mountain) indicates 22 to 35 inches of precipitation or more.

Numerals and capital letters in the second and third positions after the hyphen indicate characteristics of the soil. The numeral *3* shows the soil depth to the inhibiting layer; *4* shows that the soil has coarse fragments below the surface layer; *5* shows that the permeability of the soil is slow; and *8* shows that the soil is affected by salt and alkali. The letter *A* shows that the soil is under aspen; *C* shows that the soil is under conifers; *J* shows that the soil is under juniper; *X* shows a problem or limitation caused by gravel, cobbles, or stones on the surface or in the soil profile; and *E* shows that the soil is subject to a high hazard of erosion.

The acreage of soils in each capability class and subclass is shown in table 3. The capability classification of each map unit is given in the section "Detailed soil map units."

rangeland

Range is the most important agricultural resource in the survey area. Approximately 494,000 acres, or 75 percent of the survey area, is used as rangeland. The dominant vegetation is perennial grasses, shrubs, and forbs. Some areas support aspen, maple, juniper, and coniferous trees. All of these areas, except those that support coniferous trees, are grazable.

Range is used primarily as forage for cattle, sheep, and big game and upland game species. Most of the range is in areas where slopes are less than 30 percent, although some is in much steeper areas. The livestock are wintered mostly in areas of hayland and are supplemented with hay that is harvested from the hayland. Stock watering ponds, livestock trails, and pasture fences are needed for proper distribution of livestock.

Brush management is needed on approximately 50 percent of the rangeland in the survey area, and approximately 90 percent of the rangeland can be improved by proper management. Fires and excessive use have resulted in deterioration of the rangeland.

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

Table 4 shows, for each soil, the range site; the total annual production of vegetation in favorable, normal, and unfavorable years; the characteristic vegetation; and the average percentage of each species. Only those soils that are used as or are suited to rangeland are listed. Explanation of the column headings in table 4 follows.

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

Total production is the amount of vegetation that can be expected to grow annually on well managed rangeland that is supporting the potential natural plant community. It includes all vegetation, whether or not it is palatable to grazing animals. It includes the current year's growth of leaves, twigs, and fruits of woody plants. It does not include the increase in stem diameter of trees and shrubs. It is expressed in pounds per acre of air-dry vegetation for favorable, normal, and unfavorable years. In a favorable year, the amount and distribution of precipitation and the temperatures make growing conditions substantially better than average. In a normal year, growing conditions are about average. In an unfavorable year, growing conditions are well below average, generally because of low available soil moisture.

Dry weight is the total annual yield per acre reduced to a common percent of air-dry moisture.

Characteristic vegetation—the grasses, forbs, and shrubs that make up most of the potential natural plant community on each soil—is listed by common name. Under *composition*, the expected percentage of the total annual production is given for each species making up the characteristic vegetation. The amount that can be

used as forage depends on the kinds of grazing animals and on the grazing season.

Range management requires a knowledge of the kinds of soil and of the potential natural plant community. It also requires an evaluation of the present range condition. Range condition is determined by comparing the present plant community with the potential natural plant community on a particular range site. The more closely the existing community resembles the potential community, the better the range condition. Range condition is an ecological rating only. It does not have a specific meaning that pertains to the present plant community in a given use.

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

Plants growing on the range in different parts of the survey area are affected by differences in the soils and by differences in climate. Five distinct climatic regimes are recognized in the survey area. These regimes are determined on the basis of differences in the amount of moisture received and on differences in the average annual temperature and the length of the growing season.

The five climatic regimes are the semidesert climatic regime, the upland climatic regime, the mountain climatic regime, the high mountain climatic regime, and the wet and semiwet climatic regime.

Semidesert climatic regime—The average annual precipitation ranges from 8 to 12 inches and occurs mainly in fall and winter. The precipitation in summer contributes little to the growth of plants. The growing season is from about April 15 to June 15, or until the soil moisture is depleted or plants mature. The frost-free period is 50 to 70 days. The mean annual temperature is about 45 to 50 degrees F.

Upland climatic regime.—The average annual precipitation ranges from 12 to 16 inches and occurs mostly as snow in winter. The precipitation in summer contributes little to the growth of plants. The growing season is from about April 10 to July 1, or until the soil moisture is depleted or plants mature. Some plants show growth late in summer and early in fall if moisture is available. The frost-free period is 60 to 90 days. The mean annual temperature is 40 to 44 degrees F. Elevation ranges from about 5,900 to 7,800 feet.

Mountain climatic regime.—The average annual precipitation ranges from 16 to 22 inches and occurs mostly as snow in winter. The precipitation in summer contributes little to the growth of plants. The growing season is from about April 15 to July 31, or until the soil moisture is depleted or plants mature. When moisture is available, some plants show growth late in summer or early in fall. Mountain range sites are on all exposures and slopes. The mean annual temperature is 36 to 44 degrees F. Elevation ranges from about 6,000 to 8,500 feet.

High mountain climatic regime.—The average annual precipitation ranges from 22 to 35 inches and occurs mostly as snow in winter. The growing season generally is from about May 15 to September 20, or until the first killing frost of the fall. High mountain range sites are on all exposures and slopes. The mean annual temperature is 35 to 42 degrees F. Elevation ranges from 7,000 to 9,300 feet.

Wet and semiwet climatic regime.—In this climatic regime the soils are wet because they receive runoff water from adjacent soils or have a high water table. In these areas the climate is characterized by cold, snowy winters and warm, dry summers. The average annual precipitation ranges from 12 to 16 inches. Most of the water available to plants is from runoff water from adjacent irrigated land or from the water table. The growing season is from about April 15 to September 1, or until frost. The frost-free period is about 60 to 90 days. The mean annual temperature is about 45 degrees F.

woodland management and productivity

About 15 percent, or 100,000 acres, of the survey area is woodland, but wood products are harvested from only a comparatively small amount of this acreage. The trees that are suitable for wood products are Douglas-fir, alpine fir, Engelmann spruce, lodgepole pine, aspen, and juniper. The forested soils in the area generally are too steep and are at high elevations where the climate is too cold for cultivated crops.

Soil properties have a strong influence on the adaptation and growth of trees and on woodland management. Differences in texture and depth of the soil material affect the available water capacity and thus influence tree growth. Slope and aspect also affect tree growth and are concerns for woodland management.

Generally, trees grow fastest and tallest on the more productive soils. Tree growth is about the same on soils that have similar properties; therefore, the soils have been placed in woodland suitability groups. Each group consists of soils that have comparable potential productivity and limitations, that support similar trees, and that require similar management.

Table 5 can be used by woodland owners or forest managers in planning the use of soils for wood crops. Only those soils suitable for wood crops are listed. The table lists the ordination (woodland suitability) symbol for each soil. Soils assigned the same ordination symbol

require the same general management and have about the same potential productivity.

The first part of the *ordination symbol*, a number, indicates the potential productivity of the soils for important trees. The number 1 indicates very high productivity; 2, high; 3, moderately high; 4, moderate; and 5, low. The second part of the symbol, a letter, indicates the major kind of soil limitation. The letter *x* indicates stoniness or rockiness; *w*, excessive water in or on the soil; *t*, toxic substances in the soil; *d*, restricted root depth; *c*, clay in the upper part of the soil; *s*, sandy texture; *f*, high content of coarse fragments in the soil profile; and *r*, steep slopes. The letter *o* indicates that limitations or restrictions are insignificant. If a soil has more than one limitation, the priority is as follows: x, w, t, d, c, s, f, and r.

In table 5, *slight, moderate,* and *severe* indicate the degree of the major soil limitations to be considered in management.

Ratings of *equipment limitation* reflect the characteristics and conditions of the soil that restrict use of the equipment generally needed in woodland management or harvesting. A rating of *slight* indicates that use of equipment is not limited to a particular kind of equipment or time of year; *moderate* indicates a short seasonal limitation or a need for some modification in management or in equipment; and *severe* indicates a seasonal limitation, a need for special equipment or management, or a hazard in the use of equipment.

Seedling mortality ratings indicate the degree to which the soil affects the mortality of tree seedlings. Plant competition is not considered in the ratings. The ratings apply to seedlings from good stock that are properly planted during a period of sufficient rainfall. A rating of *slight* indicates that the expected mortality is less than 25 percent; *moderate*, 25 to 50 percent; and *severe*, more than 50 percent.

Ratings of *windthrow hazard* are based on soil characteristics that affect the development of tree roots and the ability of the soil to hold trees firmly. A rating of *slight* indicates that a few trees may be blown down by normal winds; *moderate*, that some trees will be blown down during periods of excessive soil wetness and strong winds; and *severe*, that many trees are blown down during periods of excessive soil wetness and moderate or strong winds.

Ratings of *plant competition* indicate the degree to which undesirable plants are expected to invade where there are openings in the tree canopy. The invading plants compete with native plants or planted seedlings. A rating of *slight* indicates little or no competition from other plants; *moderate* indicates that plant competition is expected to hinder the development of a fully stocked stand of desirable trees; *severe* indicates that plant competition is expected to prevent the establishment of a desirable stand unless the site is intensively prepared, weeded, or otherwise managed to control undesirable plants.

The *potential productivity* of merchantable or *common trees* on a soil is expressed as a *site index*. This index is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The site index applies to fully stocked, even-aged, unmanaged stands. Commonly grown trees are those that woodland managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability.

woodland understory vegetation

Understory vegetation consists of grasses, forbs, shrubs, and other plants. Some woodland, if well managed, can produce enough understory vegetation to support grazing of livestock or wildlife, or both, without damage to the trees.

The quantity and quality of understory vegetation vary with the kind of soil, the age and kind of trees in the canopy, the density of the canopy, and the depth and condition of the litter. The density of the canopy determines the amount of light that understory plants receive.

Table 6 shows, for each soil suitable for woodland use, the potential for producing understory vegetation. The total production of understory vegetation includes the herbaceous plants and the leaves, twigs, and fruit of woody plants up to a height of 4 1/2 feet. It is expressed in pounds per acre of air-dry vegetation in favorable, normal, and unfavorable years. In a favorable year, soil moisture is above average during the optimum part of the growing season; in a normal year, soil moisture is average; and in an unfavorable year, it is below average.

Table 6 also lists the common names of the characteristic vegetation on each soil and the percentage composition, by air-dry weight, of each kind of plant. The table shows the kind and percentage of understory plants expected under a canopy density that is most nearly typical of woodland in which the production of wood crops is highest.

recreation

Rich County provides a wide variety of recreational activities. Natural streams and lakes in the survey area provide fishing and recreation for local residents and tourists; some streams and lakes provide year-round fishing. The greatest number of visitors are attracted to Bear Lake for water-related recreation and to enjoy its esthetic value. In January, fishing for the rare Bonneville cisco is a major event for fishermen. No other lake in the continental United States offers such an opportunity.

Rich County is noted for it's hunting opportunities. Hunters return to the county year after year because of the abundance of sage grouse, ruffed grouse, blue

grouse, and big game animals such as mule deer, elk, and moose. Opportunities for waterfowl hunting are also available.

There are several private and state recreational facilities on the shores of Bear Lake. The state parks provide beaches, overnight camping, and swimming. The private facilities provide lodging, water-oriented recreation, golfing, horseback riding, and other activities.

The last several years has shown an increase in the number of visitors to Rich County, especially in the Bear Lake area. This has created a need for more detailed land use planning and decision-making. The information in this section can be used in planning, designing, and maintaining recreational areas.

The soils of the survey area are rated in table 7 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewerlines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreation use by the duration and intensity of flooding and the season when flooding occurs. In planning recreation facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 7, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 7 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 10 and interpretations for dwellings without basements and for local roads and streets in table 9.

Camp areas require site preparation such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

Paths and trails for hiking, horseback riding, and bicycling should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They have moderate slopes and no stones or boulders on the surface. The suitability of the soil for tees or greens is not considered in rating the soils.

wildlife habitat

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

Important fish species in the survey area are rainbow, brook, cutthroat, and brown trout. Bear Lake provides habitat for other species such as mackinaw, whitefish, and cisco. Small reservoirs and privately owned ponds in the area also support trout fisheries. Natural streams provide habitat for beaver, muskrat, and mink.

In the following paragraphs, the wildlife in each of the general soil map units in the survey area is discussed.

Unit 1.—Wetland wildlife species, including mallard, pintail, teal, Canadian geese, and various shore birds use this unit for nesting and feeding. Sandhill cranes and whooping crane use the unit for resting and feeding as they migrate to and from nesting areas further north. Mammals such as beaver, mink, and muskrat use the unit for habitat. Some mule deer use the unit for year-round habitat. Willows provide adequate cover for the deer, and the adjacent meadows provide forage. The

Bear River provides habitat for bald eagles, which migrate to areas of the unit in winter. Wetland areas in this unit also provides habitat for many insects, including mosquitoes, gnats, and flies. Other important wildlife species on the unit are magpie, crow, raven, garter snake, bull snake, and leopard frog.

Units 2 and 3.—These units provide feeding and nesting areas for aquatic wildlife such as mallard, teal, pintail, and Canadian geese. Sandhill crane and whooping crane use the units for feeding as they migrate to and from nesting areas further north. Sage grouse use the units for summer feeding and brood raising; the units provide succulent forage and insects necessary for the growth of chicks. The units provide habitat for many other birds, including horned lark, lark bunting, magpie, crow, and raven. Many ground squirrels, prairie dogs, moles, and mice are in the meadows, and they provide food for carnivores such as skunk, badger, red fox, gray fox, coyote, and birds of prey such as horned owl, red-tailed hawk, and marsh hawk. Deer use the vegetation in the units as forage.

Units 4 and 5.—The primary use of these units for wildlife habitat is as winter range for deer and as year-round habitat for antelope. The units also furnish excellent struting and resting areas and winter range for sage grouse. Other important wildlife species in these units include coyote, fox, badger, prairie dog, ground squirrel, raven, magpie, jackrabbit, and cottontail.

Units 6, 7, and 8.—The primary use of these units for wildlife habitat is as winter range for deer and elk and as summer range for deer and some black bear. Moose use the areas adjacent to streams as range in winter and spring. Other important wildlife species in these units are coyote, fox, badger, bobcat, raven, magpie, warbler, jackrabbit, and snowshoe hare. Because the units are used by big game as winter range, lions also use the units occasionally. Reptiles in the units include rattlesnake, bull snake, and garter snake. Areas of Rock outcrop and ledges in unit 8 provide nesting and perching areas for golden eagle and the endangered peregrine falcon. They also provide cover for rattlesnake.

Units 9 and 10.—These units provide habitat in summer for mule deer, elk, and moose. Blue grouse and ruffed grouse use the units year-round, but they prefer areas adjacent to aspen and fir. Other important wildlife species include snowshoe hare, coyote, badger, raven, and magpie. Lion and bear occasionally use areas of these units. Escarpments and ledges in unit 10 provide nesting and perching areas for birds of prey, including golden eagle and peregrine falcon.

Units 11 and 12.—These units provide summer range for big game species including elk, deer, moose, and bear. Blue grouse and ruffed grouse use the units year-round, feeding on green forage and insects in summer and aspen buds and catkins in winter. Pocket gopher and ground squirrel use these units, and they provide food for coyote and bobcat. Many birds of prey such as great horned owl, screech owl, goshawk, red-tailed hawk, and sharp-shinned hawk nest in the areas of conifers and feed in adjacent meadows. The units have an abundant population of other birds in summer. These include chickadee, vireos, nuthatches, jays, juncos, hummingbirds, ravens, and magpies.

In table 8, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are wheat, oats, and barley.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are fescue, bromegrass, clover, and alfalfa.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of wild

herbaceous plants are bluestem, goldenrod, beggarweed, wheatgrass, and grama.

Coniferous plants furnish browse, seeds, and cones. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine, spruce, fir, and juniper.

Shrubs are bushy woody plants that produce fruit, buds, twigs, bark, and foliage. Soil properties and features that affect the growth of shrubs are depth of the root zone, available water capacity, salinity, and soil moisture. Examples of shrubs are mountainmahogany, bitterbrush, snowberry, and sagebrush.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, wild millet, saltgrass, cordgrass, rushes, sedges, and reeds.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The wildlife attracted to these areas include sage grouse, jackrabbit, ground squirrel, meadowlark, field sparrow, cottontail, and red fox.

Habitat for woodland wildlife consists of areas of deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include ruffed grouse, blue grouse, thrushes, woodpeckers, gray fox, raccoon, deer, elk, and moose.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, shore birds, muskrat, mink, and beaver.

Habitat for rangeland wildlife consists of areas of shrubs and wild herbaceous plants. Wildlife attracted to rangeland include antelope, mule deer, coyote, sage grouse, meadowlark, and lark bunting.

engineering

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

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

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

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

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

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

performance of existing similar structures on the same or similar soils.

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

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

building site development

Table 9 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

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

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

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

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock or to a cemented pan, the available water capacity in the upper 40 inches, and the content of salts, sodium, and sulfidic materials affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

sanitary facilities

Table 10 shows the degree and the kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 10 also shows the suitability of the soils for use as daily cover for landfills. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

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

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

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

Table 10 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

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

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground water pollution. Ease of excavation and revegetation needs to be considered.

The ratings in table 10 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area type sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

construction materials

Table 11 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a probable or improbable source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

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

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

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place

after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

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

Sand and gravel are natural aggregates suitable for commercial use with a minimum of processing. Sand and gravel are used in many kinds of construction. Specifications for each use vary widely. In table 11, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

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

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

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

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

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

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

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

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

water management

Table 12 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas and embankments, dikes, and levees. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, irrigation, terraces and diversions, and grassed waterways.

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

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

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment.

Generally, deeper onsite investigation is needed to determine these properties.

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

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

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

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to reduce erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of wind or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of wind erosion, low available water capacity, restricted rooting depth, toxic substances such as salts or sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

soil properties

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

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

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

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

engineering index properties

Table 13 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

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

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

Classification of the soils is determined according to the Unified soil classification system (*2*) and the system adopted by the American Association of State Highway and Transportation Officials (*1*).

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

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

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

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an oven-dry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

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

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

physical and chemical properties

Table 14 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

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

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

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

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

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

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

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

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

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

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

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.05 to 0.69. The higher the value the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that

can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

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

1. Sands, coarse sands, fine sands, and very fine sands. These soils are generally not suitable for crops. They are extremely erodible, and vegetation is difficult to establish.
2. Loamy sands, loamy fine sands, and loamy very fine sands. These soils are very highly erodible. Crops can be grown if intensive measures to control wind erosion are used.
3. Sandy loams, coarse sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible. Crops can be grown if intensive measures to control wind erosion are used.

4L. Calcareous loamy soils that are less than 35 percent clay and more than 5 percent finely divided calcium carbonate. These soils are erodible. Crops can be grown if intensive measures to control wind erosion are used.

4. Clays, silty clays, clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible. Crops can be grown if measures to control wind erosion are used.
5. Loamy soils that are less than 18 percent clay and less than 5 percent finely divided calcium carbonate and sandy clay loams and sandy clays that are less than 5 percent finely divided calcium carbonate. These soils are slightly erodible. Crops can be grown if measures to control wind erosion are used.
6. Loamy soils that are 18 to 35 percent clay and less than 5 percent finely divided calcium carbonate, except silty clay loams. These soils are very slightly erodible. Crops can easily be grown.
7. Silty clay loams that are less than 35 percent clay and less than 5 percent finely divided calcium carbonate. These soils are very slightly erodible. Crops can easily be grown.
8. Stony or gravelly soils and other soils not subject to wind erosion.

Organic matter is the plant and animal residue in the soil at various stages of decomposition.

In table 14, the estimated content of organic matter of the plow layer is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

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

soil and water features

Tables 15 and 16 give estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

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

The four hydrologic soil groups are:

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

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

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

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

Flooding, the temporary inundation of an area, is caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt and water in swamps and marshes are not considered flooding.

Table 15 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, common, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *common* that it is likely under normal conditions; *occasional* that it occurs on an average of once or less in 2 years; and *frequent* that it occurs on an average of more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months; November-May, for example, means that flooding can occur during the period November through May.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay

deposited by floodwater; irregular decrease in organic matter content with increasing depth; and absence of distinctive horizons that form in soils that are not subject to flooding.

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

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The depth to a seasonal high water table applies to undrained soils. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 15 are the depth to the seasonal high water table; the kind of water table—that is, perched, artesian, or apparent; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in table 15.

An apparent water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. An artesian water table is under hydrostatic head, generally beneath an impermeable layer. When this layer is penetrated, the water level rises in an uncased borehole. A perched water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Only saturated zones within a depth of about 6 feet are indicated. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. The first numeral in the range indicates how high the water rises above the surface. The second numeral indicates the depth below the surface.

Depth to bedrock is given in table 16 if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is specified as either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

Cemented pans are cemented or indurated subsurface layers within a depth of 5 feet. Such pans cause difficulty in excavation. Pans are classified as thin or thick. A thin pan is less than 3 inches thick if continously indurated or less than 18 inches thick if discontinuous or fractured. Excavations can be made by trenching machines, backhoes, or small rippers. A thick pan is more than 3 inches thick if continously indurated or more than 18 inches thick if discontinuous or fractured. Such a pan is so thick or massive that blasting or special equipment is needed in excavation.

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

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

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

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

classification of the soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (*9*). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. In table 17, the soils of the survey area are classified according to the system. The categories are defined in the following paragraphs.

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

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

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Torriorthents (*Torri*, meaning torric moisture regime, plus *orthent*, the suborder of the Entisols that have a torric moisture regime).

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

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

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

soil series and their morphology

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

Characteristics of the soil and the material in which it formed are identified for each series. The soil is compared with similar soils and with nearby soils of other series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the Soil Survey Manual (*8*). Many of the technical terms used in the descriptions are defined in Soil Taxonomy (*9*). Unless otherwise stated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

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

Agassiz series

The Agassiz series consists of very shallow and shallow, somewhat excessively drained, moderately permeable soils on mountainsides. These soils formed in residuum and colluvium derived dominantly from limestone. Slopes range from 10 to 60 percent.

These soils are loamy-skeletal, mixed, frigid Lithic Haploxerolls.

Typical pedon of an Agassiz stony loam in an area of Agassiz-Rock outcrop complex, 25 to 60 percent slopes,

about 7,700 feet north and 400 feet east of the junction of U.S. Highway 89 and Rich County line.

A11—0 to 2 inches; dark brown (7.5YR 3/2) stony loam, brown (10YR 4/3) dry; weak fine granular structure; soft, friable; 20 percent gravel, 8 percent cobbles, and 5 percent stones; moderately alkaline (pH 8.0); clear wavy boundary.

A12—2 to 6 inches; dark brown (7.5YR 3/2) very gravelly loam, brown (10YR 4/3) dry; weak fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; 40 percent gravel; moderately alkaline (pH 8.0); gradual irregular boundary.

C1—6 to 10 inches; dark brown (10YR 3/3) extremely gravelly loam, brown (10YR 5/3) dry; weak fine subangular blocky structure; slightly hard, friable, slightly plastic; 50 percent gravel and 15 percent cobbles; slightly calcareous; disseminated carbonates; moderately alkaline (pH 8.2); abrupt irregular boundary.

R—10 inches; fractured limestone.

Thickness of the mollic epipedon ranges from 10 to 15 inches. Bedrock is at a depth of 10 to 20 inches.

The A horizon has hue of 10YR or 7.5YR, value of 4 or 5 when dry and 2 or 3 when moist, and chroma of 2 or 3 when moist or dry. The upper part of this horizon is stony loam or very stony loam, and the lower part is very gravelly loam or very cobbly loam. The A horizon is 30 to 45 percent rock fragments, of which 10 to 20 percent is gravel, 5 to 25 percent is cobbles, and 2 to 15 percent is stones.

The C horizon has hue of 10YR or 7.5YR, value of 4 or 5 when dry and 3 or 4 when moist, and chroma of 2 to 4. The horizon is 55 to 65 percent rock fragments, of which 40 to 50 percent is gravel and 15 to 20 percent is cobbles.

Alhark series

The Alhark series consists of deep and very deep, well drained, moderately permeable soils on foothills. These soils formed in colluvium, alluvium, and residuum derived dominantly from sandstone. Slopes range from 4 to 30 percent.

These soils are fine-loamy, mixed, frigid Xerollic Calciorthids.

Typical pedon of Alhark loam, 6 to 15 percent slopes, about 2,200 feet and 1,400 feet south of the northeast corner of sec. 9, T. 10 N., R. 6 E.

A1—0 to 5 inches; brown (7.5YR 5/4) loam, reddish brown (5YR 4/4) moist; weak fine granular structure; soft, friable, slightly sticky and slightly plastic; 10 percent gravel; strongly calcareous; disseminated carbonates; strongly alkaline (pH 8.6); abrupt smooth boundary.

C1ca—5 to 10 inches; reddish yellow (5YR 6/6) loam, yellowish red (5YR 4/8) moist; weak fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; strongly calcareous; disseminated carbonates; very strongly alkaline (pH 9.2); clear wavy boundary.

C2ca—10 to 17 inches; reddish yellow (5YR 7/6) loam, yellowish red (5YR 5/8) moist; weak fine and medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; 5 percent gravel; very strongly calcareous; disseminated carbonates; very strongly alkaline (pH 9.2); clear wavy boundary.

C3ca—17 to 24 inches; reddish yellow (5YR 7/6) loam, yellowish red (5YR 5/8) moist; weak fine subangular blocky structure; hard, friable, slightly sticky and plastic; 10 percent gravel; very strongly calcareous; disseminated carbonates; very strongly alkaline (pH 9.2); gradual wavy boundary.

C4—24 to 42 inches; reddish yellow (5YR 6/6) gravelly loam, yellowish red (5YR 4/8) moist; massive; soft, very friable, slightly sticky; few fine roots; 16 percent gravel; strongly calcareous; disseminated carbonates; very strongly alkaline (pH 9.4).

C5r—42 inches; soft sandstone.

Weathered sandstone commonly is at a depth of 40 to 60 inches, but in some areas it is at a depth of more than 60 inches. The ochric epipedon and the layer of carbonate accumulation are at a depth of 4 to 13 inches. The 10- to 40-inch control section is 0 to 30 percent rock fragments, mostly gravel.

The A1 horizon has hue of 5YR or 7.5YR, value of 4 or 5 when dry and 3 or 4 when moist, and chroma of 4 to 6 when dry and 3 or 4 when moist. The horizon is 0 to 10 percent gravel. It is moderately alkaline or strongly alkaline and is moderately calcareous or strongly calcareous.

The Cca horizon dominantly has hue of 5YR or 7.5YR, but in some places it has hue of 2.5YR. The horizon has value of 5 to 7 when dry and 4 or 5 when moist, and it has chroma of 4 to 6 when dry and 4 to 8 when moist. It is loam, silt loam, or gravelly loam and is 0 to 20 percent gravel. The Cca horizon is strongly alkaline or very strongly alkaline and is strongly calcareous or very strongly calcareous.

The C horizon has hue of 2.5Y or 5YR, value of 6 to 8 when dry and 4 or 5 when moist, and chroma of 4 to 8 when dry and 7 or 8 when moist. It ranges from loam to very gravelly loam and is 0 to 40 percent gravel. The C horizon is strongly calcareous or very strongly calcareous.

Ant Flat series

The Ant Flat series consists of very deep, well drained, slowly permeable soils on foothills. These soils

formed in alluvium derived dominantly from sandstone, quartzite, and limestone. Slopes range from 10 to 25 percent.

These soils are fine, montmorillonitic, frigid Calcic Argixerolls.

Typical pedon of Ant Flat silt loam, dry, 10 to 25 percent slopes, about 600 feet south and 2,300 feet east of the northwest corner of sec. 9, T. 13 N., R. 5 E.

Ap—0 to 6 inches; dark brown (7.5YR 3/2) silt loam, brown (7.5YR 4/3) dry; weak fine granular structure; slightly hard, friable, sticky and plastic; neutral (pH 6.8); abrupt smooth boundary.

A12—6 to 12 inches; dark brown (7.5YR 3/2) silty clay loam, brown (7.5YR 4/2) dry; moderate medium and coarse subangular blocky structure; hard, friable, sticky and plastic; neutral (pH 6.8); clear wavy boundary.

B21t—12 to 20 inches; brown (7.5YR 4/4) silty clay loam, light brown (7.5YR 6/4) dry; strong fine and medium subangular blocky structure; very hard, firm, sticky and very plastic; many thin clay films; neutral (pH 7.0); clear wavy boundary.

B22t—20 to 33 inches; brown (7.5YR 4/4) silty clay, light brown (7.5YR 6/4) dry; moderate medium and coarse prismatic structure parting to strong medium subangular blocky; extremely hard, firm, sticky and very plastic; continuous moderately thick clay films; neutral (pH 7.0); clear wavy boundary.

B23tca—33 to 47 inches; brown (7.5YR 5/4) silty clay, light brown (7.5YR 6/4) dry; weak medium prismatic structure parting to moderate fine and medium angular blocky; extremely hard, firm, sticky and very plastic; many moderately thick clay films; moderately calcareous; filaments of carbonates; moderately alkaline (pH 8.3); gradual wavy boundary.

B3ca—47 to 60 inches; brown (7.5YR 5/4) silty clay loam, light brown (7.5YR 6/4) dry; weak coarse subangular blocky structure; very hard, friable, sticky and plastic; strongly calcareous; filaments and soft masses of carbonates; strongly alkaline (pH 8.5).

The mollic epipedon is 10 to 15 inches thick. The solum is 22 to 35 inches thick. Depth to the layer of calcium carbonate accumulation is 25 to 35 inches.

The A horizon has hue of 10YR or 7.5YR, value of 3 or 4 when dry and 2 or 3 when moist, and chroma of 2 or 3 when dry or moist. It is 0 to 5 percent gravel.

The B2t horizon has value of 5 or 6 when dry and 4 or 5 when moist, and it has chroma of 3 or 4 when dry or moist. It is more than 35 percent clay.

The B3ca horizon has hue of 5YR or 7.5YR, value of 6 to 8 when dry and 5 to 7 when moist, and chroma of 3 to 6 when dry or moist.

Baird Hollow series

The Baird Hollow series consists of very deep, well drained, slowly permeable soils on mountainsides. These soils formed in colluvium derived dominantly from sandstone, siltstone, and conglomerate. Slopes range from 10 to 25 percent.

These soils are clayey-skeletal, montmorillonitic Cryic Paleborolls.

Typical pedon of Baird Hollow silt loam, 10 to 25 percent slopes, about 300 feet west of the south quarter corner of sec. 1, T. 13 N., R. 4 E.

O1—1 inch to 0; partially decomposed leaves and twigs.

A11—0 to 5 inches; very dark brown (10YR 2/2) silt loam, dark grayish brown (10YR 4/2) dry; moderate fine and medium granular structure; soft, friable, slightly sticky and slightly plastic; 5 percent gravel; neutral (pH 6.6); clear wavy boundary.

A12—5 to 19 inches; dark brown (10YR 3/3) gravelly clay loam, brown (10YR 4/3) dry; weak fine and medium subangular blocky structure; slightly hard, friable, slightly sticky and plastic; 30 percent gravel and 5 percent cobbles; slightly acid (pH 6.4); abrupt wavy boundary.

A2—19 to 26 inches; dark brown (10YR 4/3) gravelly clay loam, pale brown (10YR 6/3) dry; weak fine granular structure; hard, firm, sticky and very plastic; 30 percent gravel; slightly acid (pH 6.3); clear wavy boundary.

B21t—26 to 36 inches; brown (7.5YR 5/4) very cobbly heavy clay loam, light brown (7.5YR 6/4) dry; strong fine subangular blocky structure; extremely hard, very firm, very sticky and very plastic; many thin clay films; 30 percent gravel and 20 percent cobbles; slightly acid (pH 6.2); gradual wavy boundary.

B22t—36 to 60 inches; brown (7.5YR 5/4) extremely cobbly heavy clay loam, light brown (7.5YR 6/4) dry; strong fine subangular blocky structure; extremely hard, very firm, very sticky and very plastic; many thin clay films; 25 percent gravel and 35 percent cobbles; slightly acid (pH 6.2).

The solum is more than 60 inches thick. The mollic epipedon is 15 to 19 inches thick. The control section is 35 to 55 percent rock fragments, of which 25 to 35 percent is gravel and 20 to 35 percent is cobbles.

The A1 horizon has hue of 10YR or 7.5YR, value of 2 or 3 when moist, and chroma of 2 or 3 when dry and 1 to 3 when moist. It is 5 to 20 percent rock fragments, of which 5 to 20 percent is gravel and 0 to 5 percent is cobbles.

The A2 horizon has hue of 10YR or 7.5YR, value of 5 or 6 when dry and 3 to 5 when moist, and chroma of 3 to 5 when dry and 2 or 3 when moist. It is 15 to 30 percent gravel.

The Bt horizon has hue of 10YR to 5YR, value of 5 or 6 when dry and 4 to 6 when moist, and chroma of 4 to 6 when dry or moist.

Bear Lake series

The Bear Lake series consists of very deep, very poorly drained and poorly drained, slowly permeable soils on flood plains. These soils formed in calcareous alluvium derived from mixed parent material. Slopes range from 0 to 1 percent.

These soils are fine-silty, frigid Typic Calciaquolls.

Typical pedon of Bear Lake silt loam, about 1,550 feet east and 2,150 feet south of the northwest corner of sec. 22, T. 13 N., R. 5 E.

Ap—0 to 7 inches; black (10YR 2/1) silt loam, dark gray (10YR 4/1) dry; moderate medium granular structure; hard, firm, slightly sticky and plastic; strongly calcareous; moderately alkaline (pH 8.3); abrupt smooth boundary.

A12—7 to 16 inches; very dark gray (10YR 3/1) silty clay loam, gray (10YR 5/1) dry; moderate fine subangular blocky structure; hard, firm, slightly sticky and plastic; strongly calcareous; moderately alkaline (pH 8.3); gradual wavy boundary.

C1cag—16 to 26 inches; gray (10YR 6/1) silty clay loam, white (10YR 8/1) dry; few fine distinct brown (7.5YR 5/4) mottles; weak medium subangular blocky structure; very hard, friable, slightly sticky and slightly plastic; strongly calcareous; carbonates are disseminated and in few fine and medium concretions; moderately alkaline (pH 8.1); clear wavy boundary.

C2cag—26 to 37 inches; gray (10YR 6/1) silty clay loam, light gray (10YR 7/2) dry; common fine distinct brown (7.5YR 5/4) mottles; weak medium subangular blocky structure; very hard, friable, slightly sticky and slightly plastic; strongly calcareous; carbonates are disseminated and in few fine and medium concretions; moderately alkaline (pH 8.1); clear wavy boundary.

C3cag—37 to 48 inches; gray (10YR 6/1) silt loam, very pale brown (10YR 7/4) dry; few fine prominent reddish brown (5YR 4/4) mottles; massive; slightly hard, friable; disseminated lime; strongly calcareous; moderately alkaline (pH 8.1); clear wavy boundary.

IIC4—48 to 60 inches; brown (10YR 5/3) very gravelly loamy sand, very pale brown (10YR 7/3) dry; single grain; loose; 60 percent gravel; strongly calcareous; moderately alkaline (pH 8.1).

The mollic epipedon is 9 to 19 inches thick. Depth to the seasonal high water table ranges from 0 to 24 inches. The control section is 40 to 55 percent calcium carbonate. The calcic horizon is at a depth of 9 to 20 inches.

The A horizon has hue of 10YR to 2.5Y, value of 2 or 3 when moist and 2 to 5 when dry, and chroma of N to 2 when moist or dry. It is silt loam or silty clay loam. The horizon is moderately alkaline to strongly alkaline. In some pedons, the A horizon is more than 40 percent finely divided lime and value is 3 to 5 when moist.

The C horizon has hue of 10YR to 5Y, value of 4 to 7 when moist and 5 to 8 when dry, and chroma of N to 3. It commonly is silty clay loam, but it is silt loam or very fine sandy loam in some pedons. The C horizon is moderately alkaline or strongly alkaline.

The IIC horizon, where present, commonly is coarse sand or sand, but it is very gravelly loamy sand or gravelly sand in some pedons. The horizon is 0 to 60 percent gravel. It is moderately alkaline or strongly alkaline.

Bequinn series

The Bequinn series consists of very deep, well drained, moderately permeable soils on mountainsides. These soils formed in colluvium derived from conglomerate. Slopes range from 30 to 50 percent.

These soils are loamy-skeletal, mixed (calcareous), frigid Xeric Torriorthents.

Typical pedon of Bequinn very gravelly loam, 30 to 50 percent slopes, about 1,200 feet south and 700 feet east of the northwest corner of sec. 17, T. 14 N., R. 8 E.

A1—0 to 5 inches; dark brown (7.5YR 4/3) very gravelly loam, dark brown (7.5YR 3/2) moist; weak fine granular structure; soft, friable, slightly sticky and slightly plastic, 40 percent gravel; mildly alkaline (pH 7.8); clear smooth boundary.

C1—5 to 12 inches; brown (10YR 5/3) very gravelly loam, dark brown (10YR 4/3) moist; weak fine subangular blocky structure parting to weak fine granular; slightly hard, friable, slightly sticky and slightly plastic; 55 percent gravel; moderately calcareous; strongly alkaline (pH 8.8); gradual wavy boundary.

C2—12 to 26 inches; pale brown (10YR 6/3) very gravelly sandy loam, grayish brown (10YR 5/2) moist; weak fine subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; 60 percent gravel; strongly calcareous; strongly alkaline (pH 8.9); gradual wavy boundary.

C3—26 to 60 inches; light brownish gray (10YR 6/2) extremely gravelly loamy sand, brown (10YR 4/3) moist; single grain; loose; 80 percent gravel; strongly calcareous; strongly alkaline (pH 8.6).

The control section is 60 to 75 percent rock fragments, of which 50 to 65 percent is gravel and 0 to 20 percent is cobbles.

The A horizon has hue of 10YR to 7.5YR, value of 4 or 5 when dry and 3 or 4 when moist, and chroma of 3

to 6 when moist or dry. It is mildly alkaline to strongly alkaline.

The C horizon has hue of 10YR, 7.5YR, or 5YR, value of 5 to 8 when dry and 3 to 5 when moist, and chroma of 2 to 6 when dry or moist. The upper part of the horizon is very gravelly loam or very gravelly sandy loam. The lower part is extremely gravelly loamy sand or extremely gravelly sand.

Bereniceton series

The Bereniceton series consists of very deep, well drained, moderately slowly permeable soils on alluvial fans and terraces. These soils formed in alluvium derived mainly from sandstone and limestone. Slopes are 1 to 25 percent.

These soils are fine-loamy, mixed (calcareous), frigid Xeric Torriorthents.

Typical pedon of Bereniceton silt loam, cool, 1 to 3 percent slopes, about 2,590 feet east and 50 feet north of the southwest corner of sec. 17, T. 12 N., R. 8 E.

A1—0 to 8 inches; pale brown (10YR 6/3) silt loam, dark brown (10YR 4/3) moist; weak medium platy structure; slightly hard, very friable, slightly sticky and slightly plastic; strongly calcareous; moderately alkaline (pH 8.2); abrupt smooth boundary.

C1—8 to 17 inches; brown (7.5YR 5/4) loam, dark brown (7.5YR 4/4) moist; weak medium subangular blocky structure; hard, firm, slightly sticky and slightly plastic; strongly calcareous; strongly alkaline (pH 8.6); clear smooth boundary.

C2—17 to 28 inches; light yellowish brown (10YR 6/4) loam, dark yellowish brown (10YR 4/4) moist; weak medium subangular blocky structure; hard, firm, slightly sticky and slightly plastic; strongly calcareous; strongly alkaline (pH 8.6); clear smooth boundary.

C3—28 to 45 inches; light yellowish brown (10YR 6/4) loam, dark brown (10YR 4/3) moist; massive; hard, firm, slightly sticky and slightly plastic; strongly calcareous; strongly alkaline (pH 9.0); clear smooth boundary.

C4—45 to 60 inches; light yellowish brown (10YR 6/4) silty clay loam, dark brown (10YR 4/3) moist; massive; hard, firm, sticky and plastic; strongly calcareous; strongly alkaline (pH 8.6).

The control section is 18 to 30 percent clay and 0 to 15 percent rock fragments.

The A horizon has hue of 10YR or 7.5YR, value of 5 when dry and 4 when moist, and chroma of 3 or 4 when moist or dry. It is silt loam or gravelly loam.

The C horizon has hue of 10YR or 7.5YR, value of 5 or 6 when dry and 4 or 5 when moist, and chroma of 3 or 4 when moist or dry. It is loam, silt loam, or silty clay loam.

Bockston series

The Bockston series consists of very deep, well drained, moderately permeable soils on flood plains, alluvial fans, and stream terraces. These soils formed in alluvium derived from mixed parent material. Slopes range from 0 to 6 percent.

These soils are fine-loamy, mixed, frigid Aridic Calcixerolls.

Typical pedon of Bockston loam, cool, 0 to 3 percent slopes, in the SW1/4SW1/4 of sec. 30, T. 13 N., R. 8 E.

Ap—0 to 8 inches; brown (10YR 4/3) loam, dark brown (10YR 3/3) moist; weak fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine roots; common very fine and fine interstitial pores; strongly calcareous; moderately alkaline (pH 8.2); clear smooth boundary.

B2—8 to 17 inches; brown (7.5YR 5/4) silt loam, dark brown (7.5YR 4/4) moist; weak medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common very fine and fine roots; common very fine and fine interstitial pores; strongly calcareous; moderately alkaline (pH 8.2); clear smooth boundary.

C1ca—17 to 24 inches; pink (7.5YR 7/4) loam, brown (7.5YR 5/4) moist; weak medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common very fine and fine roots; common very fine and fine interstitial pores; 5 percent gravel; strongly calcareous; soft masses of carbonates; moderately alkaline (pH 8.4); clear smooth boundary.

C2ca—24 to 34 inches; light brown (7.5YR 6/4) fine sandy loam, brown (7.5YR 5/4) moist; weak medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; few very fine and fine roots; common very fine and fine interstitial pores; 8 percent gravel; strongly calcareous; soft masses of carbonates; moderately alkaline (pH 8.4); abrupt smooth boundary.

C4—34 to 40 inches; yellowish red (5YR 5/6) fine sandy loam, light reddish brown (5YR 4/6); massive; slightly hard, very friable, slightly sticky and slightly plastic; few very fine roots; many very fine and fine interstitial pores; strongly calcareous; moderately alkaline (pH 8.2); abrupt smooth boundary.

IIC5—40 to 60 inches; light brown (7.5YR 6/4) very gravelly loamy fine sand, brown (7.5YR 5/4) moist; massive; slightly hard, very friable; few very fine interstitial pores; 75 percent gravel; strongly calcareous; moderately alkaline (pH 8.2).

The mollic epipedon is 7 to 18 inches thick. The thickness of the solum and depth to free carbonates

typically are 15 to 25 inches but range to 38 inches. Depth to the very gravelly layer is 35 to 60 inches.

The A horizon has hue of 10YR or 7.5YR, value of 4 or 5 when dry and 3 when moist, and chroma of 2 or 3 when moist or dry. It is loam or silt loam.

The B horizon has hue of 10YR or 7.5YR, value of 5 or 6 when dry and 3 or 4 when moist, and chroma of 2 to 4 when moist or dry. It is loam or silt loam.

The Cca horizon has hue of 10YR, 7.5YR, or 5YR, value of 5 to 7 when dry and 4 or 5 when moist, and chroma of 2 to 6. It is loam, silt loam, or fine sandy loam.

The IIC horizon, where present, has hue of 7.5YR or 5YR, value of 6 or 7 when dry and 5 or 6 when moist, and chroma of 4 to 6. It is very gravelly fine sandy loam or very gravelly loamy fine sand.

Bullnel series

The Bullnel series consists of moderately deep, well drained, moderately slowly permeable soils on plateaus, foothills, and mountain sides. These soils formed in residuum and colluvium derived from sandstone and shale. Slopes range from 4 to 30 percent.

These soils are fine-loamy, mixed, frigid Mollic Haploxeralfs.

Typical pedon of Bullnel loam, 4 to 15 percent slopes, about 250 feet east and 900 feet north of the southwest corner of sec. 22, T. 10 N., R. 5 E.

A11—0 to 4 inches; dark reddish brown (5YR 3/4) loam, reddish brown (5YR 4/4) dry; weak fine granular structure; soft, friable, slightly sticky and slightly plastic; neutral (pH 6.6); clear smooth boundary.

A12—4 to 11 inches; dark reddish brown (5YR 3/4) loam, reddish brown (2.5YR 4/4) dry; weak fine subangular blocky structure parting to weak fine granular; slightly hard, friable, slightly sticky and plastic; neutral (pH 6.6); gradual wavy boundary.

B21t—11 to 22 inches; dark red (2.5YR 3/6) silty clay loam, red (2.5YR 4/8) dry; moderate fine and medium subangular blocky structure; hard, firm, sticky and plastic; common thin clay films; neutral (pH 6.6); gradual wavy boundary.

B22t—22 to 35 inches; dark red (2.5YR 3/6) gravelly clay loam, red (2.5YR 4/6) dry; weak fine and medium subangular blocky structure; very hard, firm, slightly sticky snd slightly plastic; few thin clay films; 20 percent gravel and 10 percent cobbles; strongly calcareous; disseminated carbonates; moderately alkaline (pH 8.4); diffuse broken boundary.

C—35 to 39 inches; dark red (2.5YR 3/6) loam, red (2.5YR 4/6) dry; massive; hard, friable, slightly sticky and slightly plastic; strongly calcareous; disseminated carbonates; strongly alkaline (pH 8.6); abrupt irregular boundary.

Cr—39 inches; soft sandstone.

Thickness of the A1 and Bt horizons is 30 to 35 inches. Depth to weathered sandstone is 20 to 40 inches. The A horizon is 0 to 5 percent gravel and cobbles, the Bt horizon is 15 to 35 percent, and the C horizon is 0 to 40 percent.

The A horizon has hue of 2.5YR or 5YR, value of 4 or 5 when dry and 3 or 4 when moist, and chroma of 3 to 6 when moist or dry. It is slightly acid or neutral.

The Bt horizon has hue of 2.5YR or 5YR, value of 4 or 5 when dry and 3 or 4 when moist, and chroma of 6 to 8 when moist or dry. It is silty clay loam, gravelly clay loam, or gravelly loam and is neutral to moderately alkaline.

The C horizon has value of 4 or 5 when dry and 3 or 4 when moist, and it has chroma of 4 to 6 when moist or dry. It ranges from loam to very cobbly loam and is moderately alkaline or strongly alkaline.

Canburn series

The Canburn series consists of very deep, poorly drained, moderately slowly permeable soils on flood plains. These soils formed in alluvium derived from mixed parent material. Slopes range from 0 to 1 percent.

These soils are fine-loamy, mixed (calcareous), frigid Cumulic Haplaquolls.

Typical pedon of Canburn silt loam, about 2,400 feet north and 400 feet west of the southeast corner of sec. 3, T. 12 N., R. 5 E.

O1—2 inches to 0; partially decomposed leaves and roots.

A11—0 to 10 inches; very dark gray (10YR 3/1) silt loam, gray (10YR 5/1) dry; many fine distinct very pale brown (10YR 7/4) mottles; weak very fine and fine granular structure; slightly hard, friable, slightly plastic; strongly calcareous; disseminated carbonates; moderately alkaline (pH 8.3); clear smooth boundary.

A12—10 to 24 inches; very dark gray (10YR 3/1) loam, gray (10YR 5/1) dry; many fine distinct very pale brown (10YR 7/4) mottles; weak fine granular structure; soft, friable, slightly plastic; strongly calcareous; disseminated carbonates and few concretions of carbonates; moderately alkaline (pH 8.3); clear wavy boundary.

C1—24 to 30 inches; gray (10YR 5/1) loam, light gray (10YR 7/1) dry; many fine distinct very pale brown (10YR 7/4) mottles; weak medium subangular blocky structure parting to moderate fine and medium granular; slightly hard, friable, slightly sticky and slightly plastic; strongly calcareous; disseminated carbonates and few concretions of carbonates; moderately alkaline (pH 8.4); gradual wavy boundary.

C2—30 to 42 inches; light gray (10YR 7/2) loam, very pale brown (10YR 7/3) dry; many fine distinct strong brown (7.5YR 5/6) mottles; massive; hard, friable, slightly sticky and slightly plastic; strongly calcareous; soft masses of carbonates and about 5 percent indurated carbonate concretions 1 millimeter to 5 millimeters in diameter; moderately alkaline (pH 8.4); clear wavy boundary.

C3—42 to 48 inches; light gray (10YR 7/2) loam, very pale brown (10YR 7/3) dry; many fine distinct strong brown (7.5YR 5/6) mottles; massive; very hard, firm, slightly sticky and plastic; strongly calcareous; filaments and soft masses of carbonates and about 5 percent indurated carbonate concretions 1 millimeter to 5 millimeters in diameter; moderately alkaline (pH 8.2); clear smooth boundary.

C4—48 to 60 inches; very pale brown (10YR 7/3) loam, light gray (10YR 7/2) dry; many fine and medium distinct strong brown (7.5YR 5/6) mottles; massive; hard, friable, slightly sticky and slightly plastic; strongly calcareous; filaments and soft masses of carbonates and about 10 percent indurated carbonate concretions 5 to 25 millimeters in diameter; moderately alkaline (pH 8.2).

The mollic epipedon is 21 to 38 inches thick.

The A horizon has value of 4 or 5 when dry and 2 or 3 when moist, and it has chroma of 1 or 2 when moist or dry.

The C horizon has value of 6 to 8 when dry and 4 to 7 when moist, and it has chroma of 1 to 4 when moist or dry. It is loam or silt loam and is moderately alkaline or strongly alkaline.

Canburn Variant

The Canburn Variant consists of very deep, somewhat poorly drained, rapidly permeable soils on lakeshores. These soils formed in beach deposits derived from mixed parent material. Slopes are 0 to 2 percent.

These soils are sandy, mixed Aquic Haploborolls.

Typical pedon of a Canburn Variant loamy sand in an area of Saleratus Variant-Canburn Variant complex, about 1,400 feet west and 200 feet south of the northeast corner of sec. 25, T. 13 N., R. 5 E.

A11—0 to 7 inches; very dark brown (10YR 2/2) loamy sand, dark grayish brown (10YR 4/2) dry; weak fine granular structure; soft, very friable; moderately calcareous; disseminated carbonates; mildly alkaline (pH 7.8); clear wavy boundary.

A12—7 to 18 inches; very dark brown (7.5YR 2/2) loamy sand, grayish brown (10YR 5/2) dry; weak fine and medium granular structure; soft, very friable; strongly calcareous; disseminated carbonates; moderately alkaline (pH 8.0); clear wavy boundary.

C1—18 to 25 inches; gray (10YR 6/1) loamy sand, very pale brown (10YR 7/3) dry; common fine distinct yellowish red (5YR 5/6) mottles; weak fine and medium subangular blocky structure parting to single grain; soft, very friable; strongly calcareous; disseminated carbonates; moderately alkaline (pH 8.2); gradual wavy boundary.

C2—25 to 48 inches; brown (7.5YR 5/3) loamy fine sand, very pale brown (10YR 7/3) dry; single grain; loose; strongly calcareous; disseminated carbonates; moderately alkaline (pH 8.2); abrupt wavy boundary.

C3—48 to 60 inches; brown (10YR 5/3) loamy fine sand, light gray (10YR 7/2) dry; single grain; loose; strongly calcareous; disseminated carbonates; moderately alkaline (pH 8.2).

The mollic epipedon is 11 to 18 inches thick. The water table fluctuates between depths of 0 and 24 inches. The profile is 10YR or 7.5YR.

The A horizon has value of 2 or 3 when moist and 3 to 5 when dry, and it has chroma of 1 or 2.

The C horizon has value of 5 or 6 when moist and 5 to 7 when dry, and it has chroma of 2 to 4. It is mainly loamy fine sand but is gravelly loamy sand in some pedons. The C horizon is moderately alkaline or strongly alkaline.

Cloud Rim series

The Cloud Rim series consists of very deep, well drained, moderately slowly permeable soils on foothills and alluvial fans. These soils formed in alluvium and colluvium derived dominantly from sandstone and quartzite. Slopes range from 4 to 15 percent.

These soils are fine-loamy, mixed, frigid Typic Argixerolls.

Typical pedon of a Cloud Rim loam, dry, in an area of Cloud Rim, dry-McCarey loams, 4 to 15 percent slopes, 2,800 feet north and 700 feet east of the southwest corner of sec. 4, T. 13 N., R. 5 E.

A1p—0 to 8 inches; very dark grayish brown (10YR 3/2) loam, dark brown (7.5YR 4/2) dry; weak medium platy structure parting to moderate fine granular; slightly hard, friable, slightly sticky and slightly plastic; neutral (pH 6.6); abrupt smooth boundary.

A12—8 to 13 inches; dark brown (10YR 3/3) loam, dark brown (7.5YR 4/2) dry; weak fine and medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; neutral (pH 6.8); gradual smooth boundary.

B21t—13 to 36 inches; dark brown (7.5YR 4/4) silty clay loam, brown (7.5YR 5/4) dry; moderate medium and coarse subangular blocky structure; extremely hard, firm, sticky and plastic; common thin clay films; neutral (pH 6.8); gradual wavy boundary.

B22t—36 to 57 inches; dark brown (7.5YR 4/4) silty clay loam, brown (7.5YR 5/4) dry; weak medium and coarse subangular blocky structure; extremely hard, friable, slightly sticky and slightly plastic; few thin clay films; neutral (pH 7.0); gradual wavy boundary.
C—57 to 70 inches; dark brown (7.5YR 4/4) loam, light brown (7.5YR 6/4) dry; massive; soft, very friable; common very fine pores; neutral (pH 7.2).

The mollic epipedon is 12 to 19 inches thick. The solum is 50 to 60 inches thick.

The A horizon has hue of 10YR or 7.5YR, value of 2 or 3 when moist, and chroma of 2 or 3 when dry or moist. It is slightly acid to mildly alkaline.

The Bt horizon has hue of 7.5YR or 5YR, and it has value of 4 or 5 when dry and 3 or 4 when moist. It is silty clay loam or clay loam.

The C horizon has hue of 7.5YR or 5YR, value of 5 to 8 when dry and 4 to 6 when moist, and chroma of 2 to 4 when moist or dry. It is loam, silt loam, or clay loam and is neutral to strongly alkaline.

Cluff series

The Cluff series consists of deep, well drained, moderately slowly permeable soils on ridges and mountainsides. These soils formed in residuum derived dominantly from sandstone. Slopes range from 10 to 40 percent.

These soils are clayey-skeletal, montmorillonitic Mollic Cryoboralfs.

Typical pedon of Cluff gravelly loam, 10 to 40 percent slopes, 2,000 feet west and 1,600 feet north of the southeast corner of sec. 21, T. 8 N., R. 4 E.

A11—0 to 4 inches; dark brown (10YR 3/3) gravelly loam, brown (10YR 5/3) dry; weak fine granular structure; soft, very friable; 30 percent gravel and 5 percent cobbles; neutral (pH 6.6); abrupt smooth boundary.
A12—4 to 14 inches; dark yellowish brown (10YR 3/4) very gravelly loam, brown (10YR 5/3) dry; weak fine granular structure; soft, friable; 35 percent gravel and 10 percent cobbles; neutral (pH 6.6); abrupt smooth boundary.
A2—14 to 20 inches; brown (7.5YR 5/4) extremely gravelly sandy clay loam, pale brown (10YR 6/3) dry; weak fine subangular blocky structure; very hard, firm, slightly sticky and slightly plastic; 50 percent gravel and 15 percent cobbles; neutral (pH 6.8); abrupt wavy boundary.
B2t—20 to 41 inches; yellowish red (5YR 4/6) extremely gravelly clay loam, yellowish red (5YR 5/6) dry; moderate fine and medium subangular blocky structure; common thick clay films; 50 percent gravel and 10 percent cobbles; slightly acid (pH 6.2); gradual irregular boundary.
R—41 inches; fractured sandstone.

Depth to bedrock ranges from 40 to 60 inches. The solum is more than 40 inches thick.

The A11 horizon is 4 to 6 inches thick. The A1 horizon has value of 3 when moist and 4 or 5 when dry, and it has chroma of 3 or 4. It is 30 to 60 percent rock fragments, of which 25 to 50 percent is gravel and 5 to 10 percent is cobbles. The A2 horizon has hue of 10YR or 7.5YR, and it has chroma of 3 or 4 when moist or dry. It is 40 to 50 percent gravel and 10 to 15 percent cobbles.

The Bt horizon has value of 5 or 6 when dry and 3 or 4 when moist, and it has chroma of 4 to 6 when moist or dry. It is 45 to 60 percent gravel and 10 to 20 percent cobbles.

Condie series

The Condie series consists of very deep, well drained, moderately slowly permeable soils on mountainsides. These soils formed in residuum and colluvium derived dominantly from conglomerate composed of sandstone and quartzite. Slopes range from 6 to 40 percent.

These soils are loamy-skeletal, mixed Mollic Cryoboralfs.

Typical pedon of Condie gravelly loam, 6 to 25 percent slopes, about 2,640 feet west and 1,400 feet north of the southeast corner of sec. 10, T. 13 N., R. 4 E.

O1—3 inches to 0; partially decomposed needles, leaves, and twigs.
A1—0 to 4 inches; dark brown (10YR 3/3) gravelly loam, light brownish gray (10YR 6/2) dry; weak fine granular structure; soft, friable, slightly sticky and slightly plastic; 20 percent gravel; slightly acid (pH 6.1); clear smooth boundary.
A2—4 to 23 inches; brown (7.5YR 5/3) gravelly fine sandy loam, light brown (7.5YR 6/3) dry; weak fine and medium subangular blocky structure; soft, friable, slightly sticky and slightly plastic; 30 percent gravel; slightly acid (pH 6.4); clear wavy boundary.
A&B—23 to 31 inches; about 50 percent A2 horizon as described in the A2 horizon above, and 50 percent B2t as described in the B2t horizon following; diffuse broken boundary.
B2t—31 to 60 inches; reddish brown (5YR 4/4) very gravelly clay loam, light reddish yellow (5YR 6/4) dry; weak medium subangular blocky structure; hard, firm, sticky and plastic; few thin clay films; 40 percent gravel and 5 percent cobbles; slightly acid (pH 6.5).

The solum is 34 to 60 inches thick or more.

The A1 horizon has hue of 10YR or 7.5YR, value of 5 or 6 when dry, and chroma of 2 or 3 when dry or moist. The A2 horizon has value of 6 or 7 when dry and 3 to 5 when moist, and it has chroma of 3 or 4 when moist or dry. It is gravelly fine sandy loam or gravelly loam. The

A2 horizon is 20 to 35 percent rock fragments, of which 20 to 30 percent is gravel and 0 to 5 percent is cobbles.

The B2t horizon has hue of 5YR or 2.5YR, value of 4 to 6 when dry, and chroma of 4 to 6 when moist or dry. It is 45 to 70 percent rock fragments, of which 40 to 65 percent is gravel and 5 to 10 percent is cobbles.

Cowco series

The Cowco series consists of very deep, well drained, slowly permeable soils on alluvial fans and flood plains. These soils formed in alluvium derived from mixed parent material. Slopes range from 0 to 6 percent.

These soils are fine-silty, mixed (calcareous), frigid Xeric Torrifluvents.

Typical pedon of Cowco loam, 0 to 3 percent slopes, about 2,100 feet south and 1,100 feet east of the northwest corner of sec. 15, T. 9 N., R. 7 E.

Ap—0 to 8 inches; brown (7.5YR 5/4) loam, dark brown (7.5YR 4/4) moist; weak fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; strongly calcareous; moderately alkaline (pH 8.2); clear smooth boundary.

C1—8 to 17 inches; brown (7.5YR 5/4) loam, dark brown (7.5YR 4/4) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; strongly calcareous; moderately alkaline (pH 8.3); clear smooth boundary.

C2—17 to 38 inches; light reddish brown (5YR 6/4) silty clay loam, reddish brown (5YR 4/3) moist; weak medium angular blocky structure; very hard, very firm, sticky and plastic; strongly calcareous; moderately alkaline (pH 8.0); clear smooth boundary.

C3—38 to 60 inches; reddish brown (5YR 5/3) silty clay loam, reddish brown (5YR 4/4) moist; massive; hard, firm, sticky and plastic; strongly calcareous; moderately alkaline (pH 8.0).

The A horizon has hue of 7.5YR or 5YR, value of 4 to 7 when dry and 3 or 4 when moist, and chroma of 2 to 4 when moist or dry. It is loam or silty clay loam. The A horizon is moderately alkaline to very strongly alkaline.

The C horizon has hue of 7.5YR or 5YR, value of 4 to 7 when dry and 3 to 5 when moist, and chroma of 2 to 6 when moist or dry. It commonly is silt loam or light silty clay loam, but it is loam in some pedons. The C horizon is moderately alkaline to very strongly alkaline.

Cutoff series

The Cutoff series consists of moderately deep, well drained, moderately permeable soils on foothills. These soils formed in residuum and colluvium derived dominantly from sandstone. Slopes range from 6 to 60 percent.

These soils are loamy-skeletal, mixed, frigid Calcixerollic Xerochrepts.

Typical pedon of Cutoff gravelly loam, 25 to 60 percent slopes, about 1,400 feet south and 100 feet west of the northeast corner of sec. 11, T. 10 N., R. 5 E.

A1—0 to 5 inches; dark reddish brown (5YR 3/5) gravelly loam, reddish brown (5YR 4/4) dry; weak fine granular structure; soft, very friable; 15 percent gravel; strongly calcareous; disseminated carbonates; moderately alkaline (pH 8.0); clear wavy boundary.

B2—5 to 13 inches; red (2.5YR 4/6) gravelly loam, yellowish red (5YR 5/8) dry; moderate fine subangular blocky structure; soft, friable; 20 percent gravel and 5 percent cobbles; strongly calcareous; carbonates on undersides of rock fragments; moderately alkaline (pH 8.2); clear wavy boundary.

C1ca—13 to 24 inches; red (2.5YR 4/6) very gravelly loam, red (2.5YR 5/6) dry; moderate fine and medium subangular blocky structure; slightly hard, firm; 50 percent gravel; strongly calcareous; carbonates on undersides of rock fragments; moderately alkaline (pH 8.4); clear wavy boundary.

C2ca—24 to 35 inches; red (2.5YR 4/6) very gravelly loam, red (2.5YR 5/6) dry; massive; soft, very friable, nonsticky and nonplastic; 50 percent gravel; strongly calcareous; filaments of carbonates and carbonates on undersides of rock fragments; moderately alkaline (pH 8.4); abrupt wavy boundary.

R—35 inches; fractured sandstone.

The solum is 10 to 22 inches thick. Depth to sandstone is 20 to 40 inches.

The A horizon has hue of 2.5YR, 5YR, or 7.5YR, value of 4 or 5 when dry and 3 or 4 when moist, and chroma of 3 to 6 when moist or dry. It is mildly alkaline or strongly alkaline.

The B2 horizon has hue of 2.5YR, 5YR, or 7.5YR, value of 5 or 6 when dry and 3 or 4 when moist, and chroma of 4 to 8 when moist or dry. It commonly is gravelly loam or very gravelly loam, but it is very cobbly loam in some pedons. The B2 horizon is 15 to 40 percent rock fragments. It is moderately alkaline or strongly alkaline.

The C horizon has hue of 2.5YR, 5YR, or 7.5YR, value of 4 to 6 when dry and 3 to 5 when moist, and chroma of 4 to 8 when moist or dry. It commonly is very gravelly loam or very cobbly loam, but it is extremely gravelly loam or extremely cobbly loam in some pedons. The C horizon is 35 to 75 percent rock fragments. It is moderately alkaline to very strongly alkaline.

Dagan series

The Dagan series consists of deep and very deep, well drained, moderately permeable soils on foothills, mountainsides, stream-cut canyon walls, and

escarpments. These soils formed in colluvium derived from sandstone and conglomerate. Slopes range from 25 to 70 percent.

These soils are loamy-skeletal, mixed, frigid Calcic Haploxerolls.

Typical pedon of Dagan gravelly silt loam, 25 to 40 percent slopes, about 250 feet west and 2,450 feet north of the southeast corner of sec. 8, T. 14 N., R. 7 E.

A11—0 to 6 inches; dark brown (7.5YR 3/2) gravelly silt loam, brown (7.5YR 5/2) dry; weak fine granular structure; soft, very friable, slightly sticky and plastic; 25 percent gravel; moderately alkaline (pH 8.2); clear wavy boundary.

A12—6 to 15 inches; dark brown (7.5YR 3/2) extremely gravelly silt loam, reddish brown (5YR 4/3) dry; weak medium subangular blocky structure; 70 percent gravel; moderately alkaline (pH 8.2); gradual wavy boundary.

B2—15 to 28 inches; reddish brown (5YR 4/4) extremely gravelly silt loam, yellowish red (5YR 5/6) dry; moderate medium subangular blocky structure; hard, friable, slightly sticky and plastic; 70 percent gravel and 5 percent cobbles; slightly calcareous; soft masses of carbonates; moderately alkaline (pH 8.4); gradual wavy boundary.

C1ca—28 to 35 inches; reddish brown (5YR 4/4) extremely gravelly silt loam, yellowish red (5YR 5/6) dry; weak medium subangular blocky structure; slightly hard, very friable, slightly plastic; 80 percent gravel; strongly calcareous; soft masses of carbonates and pendants of lime and silica on undersides of rock fragments; strongly alkaline (pH 8.6); clear wavy boundary.

C2ca—35 to 60 inches; dark brown (7.5YR 4/4) extremely gravelly silt loam, light brown (7.5YR 6/4) dry; massive; soft, very friable, slightly plastic; 60 percent gravel; strongly calcareous; soft masses of carbonates; strongly alkaline (pH 8.6).

The mollic epipedon is 7 to 18 inches thick. Depth to free carbonates ranges from 19 to 34 inches. The control section is 40 to 75 percent rock fragments, of which 30 to 60 percent is gravel and 0 to 25 percent is cobbles. Sandstone or conglomerate is at a depth of 40 to 60 inches or more.

The A horizon has hue of 5YR to 7.5YR, value of 3 to 5 when dry and 2 or 3 when moist, and chroma of 2 to 4 when dry and 2 or 3 when moist. It commonly is gravelly loam or gravelly silt loam, but it is very stony loam in some pedons. The A horizon is 25 to 65 percent rock fragments, of which 20 to 55 percent is gravel, 0 to 30 percent is cobbles, and 0 to 5 percent is stones. It is mildly alkaline or moderately alkaline.

The B2 horizon has hue of 2.5YR, 5YR or 7.5YR, value of 5 or 6 when dry and 4 when moist, and chroma of 4 to 6 when dry and 3 to 6 when moist. It commonly is very gravelly loam, but it is very cobbly loam or extremely gravelly silt loam in some pedons. The B2 horizon is 50 to 75 percent rock fragments, of which 40 to 70 percent is gravel and 0 to 35 percent is cobbles. It is mildly alkaline or moderately alkaline and is slightly calcareous or strongly calcareous.

The C horizon has hue of 2.5YR, 5YR, or 7.5YR, value of 5 or 6 when dry and 3 to 5 when moist, and chroma of 4 to 8 when dry and 4 to 6 when moist. It commonly is extremely gravelly silt loam or extremely gravelly loam, but it is cobbly sandy loam in some pedons. The C horizon is 65 to 80 percent rock fragments, of which 20 to 80 percent is gravel and 0 to 60 percent is cobbles. It is moderately alkaline or strongly alkaline.

Dennot series

The Dennot series consists of deep, well drained, moderately permeable soils on foothills, alluvial fans, and toe slopes. These soils formed in colluvium and alluvium derived dominantly from conglomerate. Slopes range from 4 to 40 percent.

These soils are loamy-skeletal, mixed, frigid Typic Calcixerolls.

Typical pedon of Dennot very gravelly loam, 4 to 15 percent slopes, about 1,760 feet west and 2,400 feet north of the southeast corner of sec. 8, T. 14 N., R. 7 E.

A1—0 to 7 inches; dark reddish brown (5YR 3/3) very gravelly loam, dark brown (7.5YR 4/4) dry; weak fine to coarse subangular blocky structure parting to weak fine granular; soft, friable, slightly sticky and plastic; many fine roots and few medium and coarse roots; 30 percent gravel and 5 percent cobbles; moderately calcareous; disseminated carbonates; moderately alkaline (pH 8.2); clear wavy boundary.

B2ca—7 to 11 inches; reddish brown (5YR 5/4) very gravelly heavy loam, light brown (7.5YR 6/4) dry; moderate medium subangular blocky structure; very hard, friable, slightly sticky and slightly plastic; 45 percent gravel and 10 percent cobbles; very strongly calcareous; soft masses of carbonates; strongly alkaline (pH 8.6); clear wavy boundary.

C1ca—11 to 28 inches; yellowish red (5YR 5/6) extremely gravelly loam, reddish yellow (5YR 7/6) dry; weak fine subangular blocky structure; slightly hard, very friable; 55 percent gravel and 10 percent cobbles; very strongly calcareous; soft masses and filaments of carbonates; strongly alkaline (pH 8.6); clear wavy boundary.

C2ca—28 to 36 inches; dark red (2.5YR 3/6) extremely gravelly sandy loam, red (2.5YR 5/6) dry; single grain; loose; 45 percent gravel and 20 percent cobbles; strongly calcareous; soft masses of carbonates; strongly alkaline (pH 8.6); gradual wavy boundary.

C3—36 to 60 inches; red (2.5YR 4/6) extremely cobbly fine sandy loam, light red (2.5YR 6/6) dry; single grain; loose; 40 percent gravel and 30 percent cobbles; strongly calcareous; soft masses of carbonates; moderately alkaline (pH 8.2).

Depth to bedrock ranges from 40 to 60 inches. The mollic epipedon is 7 to 18 inches thick. The combined thickness of the A1 and B2 horizons is 11 to 24 inches. Depth to the calcic horizon is 7 to 18 inches. The calcic horizon is 18 to 31 inches thick. The control section is 35 to 65 percent rock fragments. They are dominantly gravel but range to cobbles.

The A horizon has hue of 7.5YR or 5YR, value of 3 to 5 when dry and 3 when moist, and chroma of 3 or 4 when dry and 2 or 3 when moist. It is very gravelly loam or loam. The A horizon is 10 to 55 percent rock fragments, of which 10 to 35 percent is gravel and 0 to 25 percent is cobbles. It is very gravelly loam to loam. The A horizon is neutral to moderately alkaline and is slightly calcareous to strongly calcareous.

The B2ca horizon has hue of 7.5YR to 2.5YR, value of 4 to 7 when dry and 3 to 6 when moist, and chroma of 4 to 6 when dry or moist. It commonly is very gravelly loam, but it is gravelly loam in some pedons. The B2 horizon is 30 to 55 percent rock fragments, of which 30 to 45 percent is gravel and 0 to 10 percent is cobbles. It is moderately alkaline or strongly alkaline.

The Cca horizon has hue of 5YR or 2.5YR, value of 5 to 7 when dry and 4 or 5 when moist, and chroma of 4 to 8 when dry and 6 to 8 when moist. It is 35 to 70 percent rock fragments, of which 25 to 55 percent is gravel and 0 to 20 percent is cobbles.

The C horizon has hue of 2.5YR or 5YR, value of 5 to 7 when dry and 3 or 4 when moist, and chroma of 4 to 6 when dry or moist. It is very gravelly loam, extremely gravelly sandy loam, or extremely cobbly fine sandy loam. The C horizon is 35 to 70 percent rock fragments, of which 25 to 60 percent is gravel and 0 to 30 percent is cobbles. It is moderately alkaline or strongly alkaline.

Despain series

The Despain series consists of very deep, well drained, moderately permeable soils on mountainsides and foothills. These soils formed in colluvium derived from conglomerate composed of sandstone, limestone, and quartzite. Slopes range from 30 to 60 percent.

These soils are fine-loamy, mixed, frigid Calcic Pachic Argixerolls.

Typical pedon of Despain gravelly loam, 30 to 60 percent slopes, about 100 feet east and 800 feet north of the southwest corner of sec. 4, T. 12 N., R. 5 E.

A11—0 to 7 inches; dark brown (7.5YR 3/2) gravelly loam, brown (7.5YR 4/2) dry; weak fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; 20 percent gravel; neutral (pH 6.8); clear smooth boundary.

A12—7 to 16 inches; dark brown (7.5YR 3/2) gravelly loam, brown (7.5YR 4/3) dry; weak fine subangular blocky structure; hard, friable, slightly sticky and slightly plastic; 20 percent gravel; neutral (pH 7.0); gradual wavy boundary.

B21t—16 to 32 inches; dark brown (7.5YR 3/3) gravelly loam, brown (7.5YR 5/3) dry; moderate fine and medium subangular blocky structure; very hard, friable, sticky and plastic; 20 percent gravel; neutral (pH 7.0); gradual wavy boundary.

B22t—32 to 40 inches; brown (7.5YR 4/3) gravelly loam, strong brown (7.5YR 5/5) dry; weak fine and medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; 25 percent gravel; neutral (pH 7.2); clear wavy boundary.

Cca—40 to 60 inches; yellowish red (5YR 4/6) very gravelly loam, reddish yellow (5YR 6/6) dry; weak medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; 45 percent gravel and 10 percent cobbles; strongly calcareous; disseminated carbonates; moderately alkaline (pH 8.0).

The mollic epipedon is 20 to 40 inches thick. The A and Bt horizons are 30 to 40 inches thick. The control section is 20 to 35 percent gravel.

The A horizon has hue of 7.5YR or 10YR, value of 3 or 4 when dry and 2 or 3 when moist, and chroma of 2 or 3 when dry or moist. It is 20 to 25 percent gravel.

The Bt horizon has hue of 7.5YR or 10YR, value of 4 or 5 when dry and 3 or 4 when moist, and chroma of 3 to 5 when moist or dry. It is gravelly clay loam or gravelly loam.

The Cca horizon has hue of 5YR to 10YR, value of 5 to 7 when dry and 4 or 5 when moist, and chroma of 3 to 6 when moist or dry. It is 40 to 55 percent rock fragments, of which 25 to 55 percent is gravel and 0 to 25 percent is cobbles.

Despain Variant

The Despain Variant consists of very deep, well drained, moderately permeable soils on alluvial fans. These soils formed in alluvium derived mainly from sandstone, limestone, and quartzite. Slopes range from 1 to 3 percent.

These soils are loamy-skeletal, mixed, frigid Calcic Pachic Haploxerolls.

Typical pedon of Despain Variant gravelly loam, 1 to 3 percent slopes, about 900 feet west and 600 feet north of the southeast corner of sec. 31, T. 15 N., R. 5 E.

A11—0 to 8 inches; very dark brown (10YR 2/2) gravelly loam, very dark grayish brown (10YR 3/2) dry; weak fine granular structure; soft, very friable, slightly sticky and slightly plastic; 25 percent gravel; moderately alkaline (pH 8.2); clear smooth boundary.

A12—8 to 18 inches; very dark brown (10YR 2/2) gravelly loam, dark grayish brown (10YR 4/2) dry; weak medium subangular blocky structure; soft, friable, slightly sticky and slightly plastic; 25 percent gravel; moderately alkaline (pH 8.2); clear wavy boundary.

A13—18 to 37 inches; very dark grayish brown (10YR 3/2) very gravelly loam, dark brown (10YR 4/3) dry; weak fine subangular blocky structure; slightly hard, friable, slightly sticky and plastic; 35 percent gravel and 5 percent cobbles; strongly calcareous; disseminated carbonates; strongly alkaline (pH 8.8); gradual wavy boundary.

C1ca—37 to 57 inches; dark brown (7.5YR 3/3) extremely gravelly loam, yellowish brown (10YR 5/4) dry; weak fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; 60 percent gravel and 10 percent cobbles; very strongly calcareous; disseminated carbonates; strongly alkaline (pH 8.8); clear wavy boundary.

C2—57 to 60 inches; dark brown (7.5YR 3/3) extremely gravelly sandy loam, yellowish brown (10YR 5/4) dry; massive; soft, very friable; 65 percent gravel and 15 percent cobbles; very strongly calcareous; disseminated carbonates; strongly alkaline (pH 8.8).

The mollic epipedon is 20 to 37 inches thick. The profile is 35 to 65 percent rock fragments.

The A horizon has hue of 10YR, value of 3 or 4 when dry and 2 or 3 when moist, and chroma of 1 to 3.

The C horizon has hue of 10YR or 7.5YR, value of 5 or 6 when dry and 3 to 5 when moist, and chroma of 2 to 4. It is very gravelly loam or extremely gravelly sandy loam and is moderately alkaline to strongly alkaline.

Duckree series

The Duckree series consists of very deep, somewhat excessively drained, moderately rapidly permeable soils on foothills, alluvial fans, and terraces. These soils formed in colluvium and alluvium derived dominantly from quartzite, chert, and sandstone. Slopes range from 0 to 50 percent.

These soils are loamy-skeletal, mixed, frigid Xerollic Calciorthids.

Typical pedon of Duckree gravelly silt loam, 15 to 40 percent slopes, about 1,150 feet north and 200 feet west of the southeast corner of sec. 20, T. 12 N., R. 7 E.

A1—0 to 6 inches; yellowish brown (10YR 5/4) gravelly silt loam, brown (7.5YR 4/4) moist; weak coarse subangular blocky structure parting to weak fine granular; soft, very friable, slightly sticky and slightly plastic; 20 percent gravel; strongly calcareous; disseminated carbonates; strongly alkaline (pH 8.7); clear smooth boundary.

B2—6 to 15 inches; light brown (7.5YR 6/4) gravelly loam, yellowish red (5YR 5/6) moist; weak fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; 30 percent gravel; strongly calcareous; disseminated carbonates; strongly alkaline (pH 9.0); clear wavy boundary.

C1ca—15 to 28 inches; light brown (7.5YR 6/4) very gravelly loam, yellowish red (5YR 5/6) moist; weak fine and medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; 30 percent gravel and 5 percent cobbles; strongly calcareous; soft masses of carbonates on rock fragments; very strongly alkaline (pH 9.1); clear wavy boundary.

C2—28 to 37 inches; reddish yellow (5YR 6/6) very gravelly loam, yellowish red (5YR 4/8) moist; massive; soft, very friable; 45 percent gravel and 5 percent cobbles; strongly calcareous; disseminated carbonates; strongly alkaline (pH 9.0); gradual wavy boundary.

C3—37 to 60 inches; reddish yellow (5YR 6/6) extremely gravelly loamy sand, yellowish red (5YR 4/6) moist; single grain; loose; 65 percent gravel and 10 percent cobbles; strongly calcareous; disseminated carbonates; strongly alkaline (pH 8.7).

Thickness of the solum and depth to free carbonates typically are about 15 inches but range from 7 to 18 inches. The 10- to 40-inch control section averages 40 to 65 percent rock fragments. The content of rock fragments increases with depth. They typically are rounded gravel but range to cobbles.

The A1 horizon has hue of 10YR or 7.5YR, value of 4 or 5 when dry and 3 or 4 when moist, and chroma of 2 to 4. It commonly is gravelly silt loam or gravelly loam, but it is very gravelly loam or loam in some pedons. The A1 horizon is 5 to 50 percent rock fragments, of which 5 to 50 percent is gravel and 0 to 10 percent is cobbles. It is slightly calcareous to strongly calcareous and is moderately alkaline or strongly alkaline.

The B horizon has hue of 10YR, 7.5YR, or 5YR, value of 5 to 7 when dry and 4 or 5 when moist, and chroma of 2 to 4 when dry and 3 to 6 when moist. It commonly is gravelly loam, but it is loam, very gravelly loam, or very gravelly sandy loam in some pedons. The B horizon is 10 to 45 percent rock fragments, of which 10 to 45 percent is gravel and 0 to 5 percent is cobbles. The horizon is moderately calcareous or strongly calcareous and is moderately alkaline or strongly alkaline.

The Cca horizon has hue of 10YR, 7.5YR, or 5YR, value of 5 to 7 when dry and 4 to 6 when moist, and

chroma of 2 to 6. It commonly is very gravelly loam, but it is extremely gravelly sandy loam in some pedons. The Cca horizon is 35 to 70 percent rock fragments, of which 30 to 70 percent is gravel and 5 to 10 percent is cobbles. It is moderately alkaline to very strongly alkaline.

The C horizon has hue of 10YR, 7.5YR, or 5YR, value of 5 to 7 when dry and 4 or 5 when moist, and chroma of 1 to 6 when dry and 1 to 8 when moist. It commonly is very gravelly loam and extremely gravelly loamy sand, but it is very gravelly loam and extremely gravelly fine sandy loam in some pedons. The C horizon is 50 to 75 percent rock fragments, of which 45 to 60 percent is gravel and 5 to 25 percent is cobbles. It is moderately alkaline or strongly alkaline and is moderately calcareous or strongly calcareous.

Ellett series

The Ellett series consists of shallow and very shallow, well drained, moderately slowly permeable soils on foothills. These soils formed in residuum and colluvium derived from shale. Slopes range from 2 to 30 percent.

These soils are loamy, mixed (calcareous), frigid, shallow Xeric Torriorthents.

Typical pedon of Ellett silt loam, 2 to 10 percent slopes, about 100 feet east and 500 feet south of the northwest corner of sec. 8, T. 14 N., R. 7 E.

A1—0 to 3 inches; grayish brown (10YR 5/2) silt loam, light gray (10YR 7/2) dry; weak fine granular structure; soft, friable, slightly sticky and plastic; 10 percent soft shale fragments; strongly calcareous; disseminated carbonates; strongly alkaline (pH 8.7); clear wavy boundary.

C1—3 to 7 inches; light brownish gray (10YR 6/2) silt loam, light gray (10YR 7/2) dry; weak fine granular structure; slightly hard, friable, slightly sticky and plastic; 40 percent soft shale fragments that crush under thumb pressure; strongly calcareous; disseminated carbonates; strongly alkaline (pH 8.7); gradual wavy boundary.

C2—7 to 14 inches; grayish brown (10YR 5/2) silt loam, pale brown (10YR 6/3) dry; weak fine granular structure; slightly hard, friable, slightly sticky and plastic; 40 percent soft shale fragments that crush under thumb pressure and 10 percent hard shale fragments; strongly calcareous; disseminated carbonates; strongly alkaline (pH 8.7); abrupt wavy boundary.

Cr—14 inches; soft shale.

Depth to shale ranges from 7 to 20 inches. The profile is 5 to 55 percent soft shale fragments throughout.

The A horizon has value of 5 to 7 when dry and 3 to 5 when moist, and it has chroma of 2 to 4 when moist or dry.

The C horizon has value of 5 to 7 when dry and 4 to 6 when moist, and it has chroma of 2 to 4.

Ercan series

The Ercan series consists of deep, well drained, moderately slowly permeable soils on mountainsides. These soils formed in residuum and colluvium derived from sandstone. Slopes range from 3 to 30 percent.

These soils are fine-loamy, mixed Cryic Paleborolls.

Typical pedon of Ercan loam, 3 to 15 percent slopes, 1,900 feet west and 200 feet south of the northeast corner of sec. 34, T. 8 N., R. 5 E.

A11—0 to 4 inches; very dark grayish brown (10YR 3/2) loam, dark brown (10YR 4/3) dry; weak fine granular structure; soft, friable, slightly sticky and slightly plastic; slightly acid (pH 6.1); clear smooth boundary.

A12—4 to 16 inches; dark brown (10YR 3/3) loam, brown (10YR 5/3) dry; weak fine subangular blocky structure parting to weak fine granular; soft, friable, slightly sticky and slightly plastic; 5 percent gravel; slightly acid (pH 6.0); abrupt wavy boundary.

A2—16 to 28 inches; strong brown (7.5YR 5/6) loam, reddish yellow (7.5YR 7/6) dry; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; 10 percent gravel; slightly acid (pH 6.0); abrupt irregular boundary.

B2t—28 to 57 inches; yellowish red (5YR 5/6) gravelly clay loam, reddish yellow (5YR 6/6) dry; strong medium prismatic structure parting to moderate fine subangular blocky; very hard, very firm, sticky and plastic; 25 percent gravel; common moderately thick clay films on peds; medium acid (pH 5.7); diffuse wavy boundary.

Cr—57 inches; fractured sandstone.

Depth to sandstone ranges from 40 to 60 inches. The mollic epipedon is 15 to 19 inches thick. The combined thickness of the A and Bt horizons is 40 to 60 inches.

The A1 horizon has value of 4 or 5 when dry and chroma of 2 or 3 when moist or dry. It is 0 to 10 percent gravel.

The A2 horizon has value of 7 or 8 when dry and chroma of 3 to 6 when moist or dry. It is loam or fine sandy loam and is 0 to 15 percent gravel.

The Bt horizon has value of 5 or 6 when dry and 4 or 5 when moist, and it has chroma of 5 or 6 when moist or dry. It is gravelly clay loam or sandy clay loam and is 0 to 25 percent gravel.

Etchen series

The Etchen series consists of moderately deep, well drained, moderately slowly permeable soils on uplands and mountainsides. These soils formed in residuum and

colluvium derived from sandstone and conglomerate. Slopes range from 25 to 40 percent.

These soils are loamy-skeletal, mixed, frigid Mollic Haploxeralfs.

Typical pedon of Etchen very cobbly loam, 25 to 40 percent slopes, 1,700 feet east and 1,600 feet south of the northwest corner of sec. 3, T. 6 N., R. 6 E.

A1—0 to 4 inches; dark reddish brown (5YR 3/4) very cobbly loam, dark brown (7.5YR 4/4) dry; weak fine subangular blocky structure parting to weak fine granular; slightly hard, friable, slightly sticky and slightly plastic; 25 percent gravel and 15 percent cobbles; slightly calcareous; moderately alkaline (pH 8.4); clear smooth boundary.

B21t—4 to 10 inches; reddish brown (5YR 5/4) very gravelly clay loam, light reddish brown (5YR 6/4) dry; weak fine and medium subangular blocky structure; slightly hard, friable, sticky and slightly plastic; 35 percent gravel and 15 percent cobbles; thin patchy clay films on peds and in pores; strongly calcareous; strongly alkaline (pH 8.6); clear wavy boundary.

B22tca—10 to 21 inches; yellowish red (5YR 5/6) very gravelly clay loam, reddish yellow (5YR 6/6) dry; moderate fine and medium subangular blocky structure; hard, firm, sticky and slightly plastic; 25 percent gravel and 10 percent cobbles; thin continuous clay films on peds; strongly calcareous; strongly alkaline (pH 8.6); clear irregular boundary.

C1ca—21 to 29 inches; red (2.5YR 5/6) extremely gravelly sandy clay loam, light red (2.5YR 6/6) dry; massive; extremely hard, extremely firm, sticky and slightly plastic; 45 percent gravel and 20 percent cobbles; strongly calcareous; abrupt wavy boundary.

R—29 inches; sandstone.

Depth to bedrock is 20 to 40 inches. The combined thickness of the A and Bt horizons is 20 to 30 inches.

The A horizon has hue of 5YR or 7.5YR and chroma of 4 to 6 when moist or dry. It is 35 to 45 percent rock fragments, of which 25 to 30 percent is gravel and 15 to 20 percent is cobbles.

The Bt horizon has value of 5 or 6 when dry and 4 or 5 when moist, and it has chroma of 4 to 6 when moist or dry. It is very gravelly clay loam or very gravelly loam. The Bt horizon is 35 to 55 percent rock fragments, of which 25 to 40 percent is gravel and 5 to l5 percent is cobbles.

The C horizon has value of 5 or 6 when dry and 4 or 5 when moist. It is 65 to 80 percent rock fragments.

Falula series

The Falula series consists of shallow, somewhat excessively drained, moderately permeable soils on foothills and plateaus. These soils formed in colluvium and residuum derived from sandstone and conglomerate. Slopes range from 4 to 25 percent.

These soils are loamy-skeletal, mixed, frigid Lithic Haploxerolls.

Typical pedon of Falula very gravelly loam, 4 to 25 percent slopes, 2,200 feet east and 200 feet north of the southwest corner of sec. 1, T. 12 N., R. 6 E.

A11—0 to 4 inches; dark brown (7.5YR 3/2) very gravelly loam, brown (7.5YR 4/4) dry; weak fine granular structure; soft, friable; 5 percent cobbles and 35 percent gravel; neutral (pH 7.2); clear smooth boundary.

A12—4 to 10 inches; dark brown (7.5YR 3/3) very gravelly loam, brown (7.5YR 4/4) dry; weak fine and medium subangular blocky structure; slightly hard, friable, slightly plastic; 40 percent gravel; moderately calcareous; soft masses of carbonates; mildly alkaline (pH 7.6); clear wavy boundary.

Cca—10 to 17 inches; brown (7.5YR 5/4) very gravelly loam, pink (7.5YR 7/4) dry; weak fine subangular blocky structure; slightly hard, friable; 55 percent gravel; strongly calcareous; coatings of carbonates on peds and rocks; moderately alkaline (pH 8.2); abrupt wavy boundary.

R—17 inches; consolidated conglomerate.

Depth to conglomerate or sandstone ranges from 8 to 19 inches. The mollic epipedon is 7 to 12 inches thick. Thickness of the solum and depth to free carbonates commonly are about 10 inches, but they range from 7 to 12 inches. The control section is 45 to 80 percent rock fragments consisting of angular gravel and some cobbles and stones. The content of rock fragments increases with depth.

The A1 horizon has hue of 10YR, 7.5YR, or 5YR, value of 3 to 5 when dry and 2 or 3 when moist, and chroma of 2 to 4 when dry and 2 or 3 when moist. It commonly is gravelly loam or very gravelly loam, but it is gravelly silt loam or loam in some pedons. The lower part of the A1 horizon in places is extremely gravelly loam, very cobbly loam, or extremely cobbly loam. The A1 horizon is 10 to 60 percent rock fragments, of which 10 to 50 percent is gravel and 0 to 45 percent is cobbles and stones. It is neutral to moderately alkaline and is noncalcareous to strongly calcareous.

The Cca horizon has hue of 7.5YR, 5YR, or 2.5YR, value of 4 to 7 when dry and 3 to 5 when moist, and chroma of 4 to 8 when dry and 3 to 6 when moist. It commonly is very gravelly or extremely gravelly loam, but it is very gravelly silt loam, very cobbly loam, or very gravelly sandy loam in some pedons. The Cca horizon is 50 to 80 percent rock fragments, of which 30 to 60 percent is gravel and 0 to 50 percent is cobbles and stones. It is mildly alkaline or moderately alkaline.

Flygare series

The Flygare series consists of very deep, well drained, moderately permeable soils on mountainsides. These soils formed in colluvium and residuum derived from quartzite. Slope ranges from 25 to 50 percent.

These soils are loamy-skeletal, mixed Cryic Pachic Paleborolls.

Typical pedon of Flygare gravelly loam, 25 to 50 percent slopes; about 3 miles north and 4 miles west of Garden City; 1,800 feet east and 2,000 feet north of Hodges Spring.

O1—1 inch to 0; partially decomposed leaves and twigs.

A11—0 to 6 inches; dark brown (7.5YR 3/2) gravelly loam, brown (7.5YR 4/2) dry; weak fine granular structure; soft, very friable, slightly sticky and slightly plastic; 25 percent gravel; slightly acid (pH 6.4); clear smooth boundary.

A12—6 to 25 inches; dark brown (7.5YR 3/2) very cobbly loam, brown (7.5YR 4/2) dry; weak coarse subangular blocky structure parting to weak fine granular; soft, very friable, slightly sticky and slightly plastic; 25 percent gravel and 15 percent cobbles; slightly acid (pH 6.5); clear wavy boundary.

A2—25 to 37 inches; yellowish brown (10YR 5/5) very cobbly loam, pale brown (10YR 6/3) dry; weak fine subangular blocky structure; slightly hard, friable, slightly plastic; 20 percent gravel, 25 percent cobbles, and 5 percent stones; neutral (pH 6.6); gradual wavy boundary.

B2t—37 to 60 inches; dark yellowish brown (10YR 4/4) extremely gravelly clay loam, light yellowish brown (10YR 6/4) dry; massive; soft, friable, slightly sticky and slightly plastic; 65 percent gravel and 15 percent cobbles; neutral (pH 6.6).

The mollic epipedon is 20 to 28 inches thick. The combined thickness of the A and Bt horizons is more than 60 inches.

The A horizon has hue of 10YR or 7.5YR, value of 2 or 3 when moist, and chroma of 2 or 3. It is 25 to 35 percent rock fragments, of which 20 to 25 percent is gravel and 0 to 15 percent is cobbles.

The A2 horizon has hue of 10YR or 7.5YR, value of 5 or 6 when dry and 4 or 5 when moist, and chroma of 3 to 5 when dry or moist. It is 35 to 55 percent rock fragments, of which 15 to 30 percent is gravel, 20 to 30 percent is cobbles, and 0 to 5 percent is stones.

The Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5 when moist, and chroma of 4 or 5 when moist or dry. It is 60 to 70 percent rock fragments, of which 50 to 60 percent is gravel and 10 to 20 percent is cobbles.

Fontreen series

The Fontreen series consists of very deep, somewhat excessively drained, moderately rapidly permeable soils on mountainsides. These soils formed in residuum and colluvium derived from limestone. Slope ranges from 10 to 40 percent.

These soils are loamy-skeletal, carbonatic, frigid Aridic Calcixerolls.

Typical pedon of a Fontreen gravelly silt loam in an area of Fontreen-Rexmont, very shallow complex, 6 to 40 percent slopes, about 2,650 feet south and 1,800 feet west of the northeast corner of sec. 36, T. 11 N., R. 7 E.

A1—0 to 14 inches; brown (10YR 4/3) gravelly silt loam, dark brown (10YR 3/3) moist; moderate fine subangular blocky structure parting to moderate very fine granular; soft, friable, slightly sticky and slightly plastic; 20 percent gravel; moderately calcareous; disseminated carbonates; moderately alkaline (pH 8.0); clear wavy boundary.

C1ca—14 to 33 inches; brown (10YR 5/3) extremely gravelly loam, brown (10YR 4/3) moist; weak very fine granular structure; soft, friable, slightly sticky; 55 percent gravel and 10 percent cobbles; very strongly calcareous; filaments and laminar pendants of carbonates as much as 1/4 inch thick on undersides of rock fragments; moderately alkaline (pH 8.4); gradual wavy boundary.

C2ca—33 to 40 inches; light yellowish brown (10YR 6/4) extremely gravelly loam, yellowish brown (10YR 5/4) moist; moderate very fine subangular blocky structure; hard, firm, slightly sticky and slightly plastic; 60 percent gravel and 5 percent cobbles; very strongly calcareous; filaments and laminar pendants of carbonates as much as 1/4 inch thick on undersides of rock fragments; strongly alkaline (pH 8.9); gradual wavy boundary.

C3ca—40 to 53 inches; very pale brown (10YR 8/3) extremely gravelly loam, very pale brown (10YR 7/3) moist; weak very fine granular structure; soft, friable, slightly sticky and slightly plastic; 75 percent gravel; very strongly calcareous; filaments and laminar pendants of carbonates as much as 1/4 inch thick on undersides of rock fragments; strongly alkaline (pH 8.9); clear wavy boundary.

C4— 53 to 60 inches; very pale brown (10YR 7/3) extremely gravelly loam, pale brown (10YR 6/3) moist; weak very fine granular structure; soft, friable, slightly sticky; 75 percent gravel; very strongly calcareous; disseminated carbonates; strongly alkaline (pH 8.6).

The mollic epipedon is 7 to 14 inches thick. The control section is 50 to 75 percent rock fragments, mainly gravel. It is 40 to 55 percent calcium carbonate.

The A horizon has hue of 10YR or 7.5YR, value of 4 or 5 when dry and 2 or 3 when moist, and chroma of 2 or 3. It is 15 to 35 percent rock fragments, of which 15 to 35 percent is gravel and 0 to 5 percent is cobbles.

The Cca horizon has value of 5 to 8 when dry and 4 to 7 when moist, and it has chroma of 2 to 4 when moist or dry. It is extremely gravelly loam or very gravelly loam. The horizon is 50 to 75 percent rock fragments, of which 45 to 75 percent is gravel and 0 to 25 percent is cobbles.

The C horizon has value of 6 or 7 when dry and 4 to 6 when moist, and it has chroma of 2 to 4 when moist or dry. It is 60 to 80 percent rock fragments, of which 60 to 80 percent is gravel and 0 to 20 percent is cobbles.

Foxol series

The Foxol series consists of shallow, somewhat excessively drained, moderately permeable soils on the sides of foothills and mountains and on ridges. These soils formed in residuum and colluvium derived from quartzite. Slope ranges from 10 to 60 percent.

These soils are loamy-skeletal, mixed, frigid Lithic Haploxerolls.

Typical pedon of Foxol very stony loam, 10 to 40 percent slopes, about 2,500 feet west and 2,300 feet north of the southeast corner of sec. 1, T. 13 N., R. 4 E.

A11—0 to 5 inches; very dark brown (10YR 2/2) very stony loam, brown (10YR 4/3) dry; weak fine granular structure; soft, friable; 20 percent gravel, 10 percent cobbles, and 25 percent stones; slightly acid (pH 6.5); clear smooth boundary.

A12—5 to 10 inches; very dark grayish brown (10YR 3/2) very cobbly loam, brown (10YR 4/3) dry; weak fine subangular blocky structure parting to weak fine granular; slightly hard, friable; 10 percent gravel, 15 percent cobbles, and 15 percent stones; slightly acid (pH 6.4); clear wavy boundary.

B2—10 to 15 inches; brown (7.5YR 4/3) very cobbly loam, brown (10YR 5/3) dry; weak fine to medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; 15 percent gravel and 35 percent cobbles; slightly acid (pH 6.4); abrupt irregular boundary.

R—15 inches; fractured quartzite.

The mollic epipedon is 8 to 12 inches thick. Depth to bedrock is 10 to 20 inches.

The A horizon has value of 2 or 3 when moist and chroma of 2 or 3 when moist or dry. It is 30 to 60 percent rock fragments, of which 15 to 20 percent is gravel, 10 to 30 percent is cobbles, and 15 to 25 percent is stones.

The B horizon has value of 4 or 5 when dry and 3 to 5 when moist, and it has chroma of 3 to 6 when moist or dry. It is 50 to 65 percent rock fragments, of which 15 to 25 percent is gravel, 25 to 35 percent is cobbles, and 0 to 10 percent is stones.

Gobine series

The Gobine series consists of very deep, well drained, moderately slowly permeable soils on uplands and flood plains. These soils formed in alluvium derived dominantly from sandstone, conglomerate, and limestone. Slopes range from 1 to 10 percent.

These soils are fine-silty, mixed, frigid Typic Calcixerolls.

Typical pedon of Gobine silt loam, 1 to 10 percent slopes, about 350 feet west and 2,250 feet north of the southeast corner of sec. 21, T. 14 N., R. 7 E.

A11—0 to 3 inches; brown (10YR 5/3) silt loam, dark brown (10YR 3/3) moist; weak fine granular structure; soft, very friable, slightly sticky and slightly plastic; moderately calcareous; moderately alkaline (pH 8.4); abrupt smooth boundary.

A12—3 to 7 inches; brown (10YR 5/3) silt loam, dark brown (10YR 3/3) moist; weak medium subangular blocky structure parting to weak fine granular; slightly hard, friable, slightly sticky and slightly plastic; moderately calcareous; moderately alkaline (pH 8.4); clear smooth boundary.

B2—7 to 21 inches; brown (10YR 5/3) silt loam, dark yellowish brown (10YR 4/4) moist; weak medium subangular blocky structure; hard, friable, slightly sticky and plastic; moderately calcareous; disseminated carbonates; moderately alkaline (pH 8.4); clear wavy boundary.

C1ca—21 to 33 inches; very pale brown (10YR 7/3) silt loam, light yellowish brown (10YR 6/4) moist; weak fine and medium subangular blocky structure; very hard, friable, slightly sticky and plastic; strongly calcareous; disseminated carbonates; moderately alkaline (pH 8.3); gradual wavy boundary.

C2ca—33 to 48 inches; very pale brown (10YR 7/3) silt loam, yellowish brown (10YR 5/4) moist; weak coarse subangular blocky structure; slightly hard, friable, sticky and plastic; strongly calcareous; disseminated carbonates; moderately alkaline (pH 8.3); gradual wavy boundary.

C3ca—48 to 60 inches; pinkish gray (7.5YR 7/2) loam, brown (7.5YR 5/4) moist; massive; slightly hard, friable, slightly sticky and plastic; strongly calcareous; disseminated carbonates; moderately alkaline (pH 8.3).

Thickness of the solum and depth to the calcic horizon are 21 to 39 inches. The control section is 0 to 10 percent gravel.

The A horizon has hue of 10YR, 7.5YR, or 5YR, value of 4 or 5 when dry and 3 when moist, and chroma of 2 or 3 when moist or dry.

The B horizon has hue of 10YR, 7.5YR, or 5YR, value of 5 to 7 when dry and 4 to 6 when moist, and chroma

of 2 to 8 when moist or dry. It is moderately alkaline or strongly alkaline.

The C horizon has hue of 10YR to 5YR, value of 5 to 8 when dry and 4 to 6 when moist, and chroma of 2 to 8 when moist or dry. It commonly is silt loam but is loam in some pedons. In some pedons layers of loamy sand and very gravelly sandy loam are below a depth of 40 inches. The C horizon is moderately alkaline or strongly alkaline.

Gridge series

The Gridge series consists of shallow, somewhat excessively drained, moderately permeable soils on stream-cut canyon walls. These soils formed in residuum and colluvium derived from sandstone and siltstone. Slopes range from 25 to 40 percent.

These soils are loamy, mixed (calcareous), frigid Lithic Xerorthents.

Typical pedon of a Gridge stony loam in an area of Gridge-Rock outcrop complex, 25 to 40 percent slopes, about 700 feet west and 1,800 feet north of the southeast corner of sec. 8, T. 14 N., R. 7 E.

C1—0 to 6 inches; red (2.5YR 4/6) stony loam, red (2.5YR 5/6) dry; weak medium and coarse subangular blocky structure parting to weak fine granular; soft, friable, slightly sticky and slightly plastic; 20 percent gravel, 5 percent cobbles, and 5 percent stones; strongly calcareous; soft masses of carbonates; strongly alkaline (pH 8.6); clear wavy boundary.

C2ca—6 to 13 inches; dark red (2.5YR 3/6) silt loam, red (2.5YR 5/6) dry; weak medium platy structure parting to weak fine and medium subangular blocky; hard, very friable, slightly sticky and plastic; strongly calcareous; soft masses of carbonates; strongly alkaline (pH 8.7); gradual wavy boundary.

C3ca—13 to 17 inches; red (2.5YR 5/8) weathered, fine grained sandstone that breaks down under thumb pressure to silt loam, reddish yellow (5YR 7/6) dry; very hard, friable, slightly sticky and plastic; strongly calcareous; soft masses of carbonates; strongly alkaline (pH 8.7); abrupt wavy boundary.

R—17 inches; sandstone.

About 5 to 10 percent of the surface is covered with angular stones. Sandstone is at a depth of 10 to 20 inches. The control section is 0 to 25 percent rock fragments, mainly angular gravel and some cobbles and stones. About 5 to 10 percent of the surface is covered with angular stones.

The upper part of the C horizon has value of 5 or 6 when dry and 3 or 4 when moist, and it has chroma of 6 to 8 when dry. It commonly is stony loam but is very stony loam in some pedons. The upper part of the C horizon is 20 to 35 percent rock fragments, of which 15 to 25 percent is gravel, 0 to 10 percent is cobbles, and 5 to 10 percent is stones. It is moderately alkaline or strongly alkaline.

The lower part of the C horizon has hue of 2.5YR or 5YR, value of 5 to 7 when dry and 3 to 5 when moist, and chroma of 6 to 8 when dry or moist. It commonly is silt loam but is gravelly silt loam or loam in some pedons. The lower part of the C horizon is 0 to 25 percent rock fragments, of which 0 to 20 percent is gravel and 0 to 5 percent is cobbles.

Guilder series

The Guilder series consists of deep, well drained, slowly permeable soil on foothills and mountainsides. These soils formed in residuum and alluvium derived from sandstone and shale. Slopes range from 15 to 25 percent.

These soils are fine, mixed, frigid Mollic Haploxeralfs.

Typical pedon of Guilder loam, 15 to 25 percent slopes, 1,400 feet west and 2,350 feet north of the southeast corner of sec. 28, T. 7 N., R. 6 E.

A1—0 to 7 inches; dark brown (7.5YR 3/2) loam, brown (7.5YR 4/4) dry; moderate fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; slightly effervescent; neutral (pH 7.0); clear wavy boundary.

A3—7 to 11 inches; dark reddish brown (5YR 3/4) loam, yellowish red (5YR 5/6) dry; weak medium subangular blocky structure; slightly sticky and slightly plastic; moderately calcareous; neutral (pH 7.0); clear smooth boundary.

B21t—11 to 20 inches; red (2.5YR 4/6) silty clay loam, reddish brown (2.5YR 5/4) dry; weak medium prismatic structure parting to moderate fine subangular blocky; very hard, very firm, very sticky and very plastic; common thin clay films on peds; moderately calcareous; mildly alkaline (pH 7.6); clear wavy boundary.

B22t—20 to 34 inches; red (2.5YR 5/6) silty clay, light red (2.5YR 6/6) dry; weak medium prismatic structure parting to moderate fine subangular blocky; very hard, very firm, very sticky and very plastic; common thin clay films on peds; moderately calcareous; moderately alkaline (pH 7.9); clear smooth boundary.

B23tca—34 to 54 inches; light red (2.5YR 6/6) silty clay loam, light reddish brown (2.5YR 6/4) dry; strong medium subangular blocky structure; extremely hard, extremely firm, sticky and plastic; few thin clay films on peds; moderately calcareous; moderately alkaline (pH 8.3); clear wavy boundary.

C—54 inches; soft weathered sandstone.

The combined thickness of the A and B horizons is 50 to 60 inches.

The A horizon has hue of 5YR or 7.5YR, value of 3 or 4 when moist and 4 or 5 when dry, and chroma of 3 to 6 when moist or dry.

The Bt horizon has hue of 2.5YR or 5YR, value of 4 to 6 when moist and 5 to 7 when dry, and chroma of 4 to 6 when moist or dry. It is silty clay loam or silty clay and is neutral to moderately alkaline.

Hades series

The Hades series consists of very deep, well drained, moderately slowly permeable soils on alluvial fans. These soils formed in alluvium derived mainly from sandstone and quartzite. Slopes range from 3 to 6 percent.

These soils are fine-loamy, mixed, frigid Pachic Argixerolls.

Typical pedon of Hades silt loam, 3 to 6 percent slopes, about 700 feet south and 800 feet west of the northeast corner of sec. 31, T. 12 N., R. 5 E.

A11—0 to 3 inches; very dark brown (10YR 3/2) silt loam, dark grayish brown (10YR 4/2) dry; weak fine granular structure; soft, very friable, slightly sticky and slightly plastic; slightly acid (pH 6.2); clear smooth boundary.

A12—3 to 10 inches; very dark brown (10YR 2/2) silt loam, brown (10YR 4/3) dry; moderate medium granular structure; slightly hard, friable, slightly sticky and slightly plastic; slightly acid (pH 6.2); gradual smooth boundary.

A13—10 to 24 inches; dark brown (7.5YR 3/2) silt loam, brown (7.5YR 5/3) dry; moderate fine granular structure; hard, friable, slightly sticky and slightly plastic; slightly acid (pH 6.2); clear wavy boundary.

B21t—24 to 32 inches; brown (7.5YR 4/4) silty clay loam, brown (7.5YR 5/4) dry; weak medium prismatic structure parting to moderate fine subangular blocky; very hard, friable, sticky and plastic; slightly acid (pH 6.2); gradual wavy boundary.

B22t—32 to 42 inches; brown (7.5YR 5/4) silty clay loam, light brown (7.5YR 6/5) dry; weak medium prismatic structure parting to moderate fine subangular blocky; very hard, friable, sticky and plastic; slightly acid (pH 6.2); clear wavy boundary.

B23t—42 to 52 inches; brown (7.5YR 4/4) silty clay loam, strong brown (7.5YR 5/6) dry; moderate fine and medium subangular blocky structure; hard, firm, sticky and plastic; 10 percent gravel; slightly acid (pH 6.4); gradual wavy boundary.

C—52 to 60 inches; yellowish brown (10YR 5/4) very gravelly loam, yellowish brown (10YR 5/6) dry; weak fine subangular blocky structure; slightly hard, very friable; 45 percent gravel; slightly acid (pH 6.4).

The mollic epipedon is 21 to 25 inches thick. The combined thickness of the A1 and Bt horizons is 50 to 60 inches.

The A horizon has hue of 10YR or 7.5YR, value of 4 or 5 when dry and 2 or 3 when moist, and chroma of 2 or 3 when dry or moist. It is 0 to 10 percent gravel. The A horizon is slightly acid or neutral.

The Bt horizon has hue of 7.5YR or 10YR, value of 5 or 6 when dry and 4 or 5 when moist, and chroma of 3 to 6 when moist or dry. It is 0 to 10 percent gravel. The Bt horizon is slightly acid to mildly alkaline.

The C horizon has chroma of 4 to 6 when moist or dry. It is 5 to 45 percent gravel. The C horizon is slightly acid to moderately alkaline.

Hawkins series

The Hawkins series consists of very deep, well drained, slowly permeable soils on mountainsides. These soils formed in alluvium and colluvium derived dominantly from tuffaceous material that is high in content of volcanic ash. Slopes range from 6 to 25 percent.

These soils are fine, montmorillonitic, frigid Typic Chromoxererts.

Typical pedon of Hawkins silty clay loam, 6 to 25 percent slopes, about 2,500 feet south and 2,500 feet west of the northeast corner of sec. 35, T. 12 N., R. 5 E.

A1—0 to 10 inches; very dark grayish brown (10YR 3/2) silty clay loam, brown (10YR 5/3) dry; strong medium and coarse granular structure; very hard, firm, sticky and plastic; cracks 2 to 3 centimeters wide extend through horizon; neutral (pH 6.8); clear smooth boundary.

B2—10 to 27 inches; dark grayish brown (10YR 4/2) clay, grayish brown (10YR 5/2) dry; strong coarse angular blocky structure; extremely hard, very firm, very sticky and very plastic; cracks I to 3 centimeters wide extend through horizon; many slickensides; neutral (pH 7.2); gradual wavy boundary.

C1ca—27 to 37 inches; light brownish gray (10YR 6/2) silty clay loam, light gray (10YR 7/2) dry; strong coarse angular blocky structure; very hard, firm, sticky and plastic; cracks 1 centimeter to 2 centimeters wide extend into horizon; common slickensides; 25 percent of ped faces have colloidal organic stains; strongly calcareous; filaments of carbonates and disseminated carbonates; strongly alkaline (pH 8.8); gradual wavy boundary.

C2ca—37 to 50 inches; light brownish gray (10YR 6/2) silty clay loam, light gray (10YR 7/2) dry; moderate coarse subangular blocky structure; very hard, firm, sticky and plastic; colloidal organic stains on 10 percent of ped faces; strongly calcareous; filaments of carbonates and disseminated carbonates; moderately alkaline (pH 8.2); gradual wavy boundary.

C3ca—50 to 60 inches; light gray (2.5Y 7/2) silty clay loam, white (2.5Y 8/2) dry; weak fine and medium subangular blocky structure; very hard, firm, sticky and plastic; strongly calcareous; disseminated carbonates; mildly alkaline (pH 7.8).

The mollic epipedon is 10 to 20 inches. Thickness of the solum and depth to free carbonates are 20 to 27 inches. Cracks are 1 centimeter to 4 centimeters wide at a depth of 50 centimeters. They extend to the surface.

The A horizon has value of 3 to 5 when dry and 2 or 3 when moist, and it has chroma of 2 or 3 when dry or moist.

The B horizon has value of 4 to 6 when dry and 3 to 5 when moist, and it has chroma of 1 or 2 when dry or moist.

The Cca horizon has hue of 10YR or 2.5Y, value of 6 or 7 when dry and 5 or 6 when moist, and it has chroma of 1 or 2 when dry or moist. It is silty clay loam or clay.

Highams series

The Highams series consists of shallow, somewhat excessively drained, moderately permeable soils on foothills and stream-cut valley sides. These soils formed in residuum and colluvium derived from limestone. Slopes range from 2 to 40 percent.

These soils are loamy-skeletal, carbonatic, frigid Lithic Xeric Torriorthents.

Typical pedon of a Highams loam in an area of Ramshorn Variant-Highams complex, 2 to 15 percent slopes, about 600 feet west and 2,650 feet south of the northeast corner of sec. 27, T. 12 N., R. 6 E.

A1—0 to 5 inches; grayish brown (10YR 5/2) loam, dark brown (10YR 3/3) moist; weak fine subangular blocky structure parting to weak fine granular; soft, friable; 10 percent gravel; moderately calcareous; disseminated carbonates; moderately alkaline (pH 8.4); clear smooth boundary.

C1—5 to 12 inches; brown (10YR 5/3) very gravelly loam, dark yellowish brown (10YR 3/4) moist; weak medium subangular blocky structure; soft, friable, slightly sticky and slightly plastic; 35 percent gravel; strongly calcareous; disseminated carbonates; strongly alkaline (pH 8.8); clear smooth boundary.

C2—12 to 17 inches; white (10YR 8/2) extremely gravelly loam, pale brown (10YR 6/3) moist; massive, slightly hard, friable, slightly sticky and slightly plastic; 70 percent gravel; strongly calcareous; disseminated carbonates; strongly alkaline (pH 9.0); abrupt wavy boundary.

R—17 inches; white limestone.

Depth to bedrock is 10 to 20 inches.

The A horizon has value of 5 to 7 when dry and 3 to 6 when moist, and it has chroma of 2 to 4 when moist or dry. It is mildly alkaline to strongly alkaline. The A horizon is 5 to 15 percent angular gravel.

The C horizon has value of 5 to 8 when dry and 3 to 6 when moist, and it has chroma of 1 to 4 when moist or dry. It is very gravelly loam or extremely gravelly loam and is moderately alkaline or strongly alkaline. The C horizon is 35 to 80 percent angular gravel.

Highams Variant

The Highams Variant consists of shallow, somewhat excessively drained, moderately permeable soils on mountainsides and ridges. These soils formed in residuum derived from limestone. Slopes range from 6 to 50 percent.

These soils are loamy, mixed (calcareous), frigid Lithic Xeric Torriorthents.

Typical profile of a Highams Variant gravelly loam in an area of Pancheri-Highams Variant-Rock outcrop complex, 6 to 50 percent slopes, about 1,100 feet north and 200 feet west of the southeast corner of sec. 17, T. 11 N., R. 8 E.

A11—0 to 6 inches; brown (10YR 5/3) gravelly loam, dark yellowish brown (10YR 4/4) moist; weak medium subangular blocky structure parting to weak fine granular; soft, friable, slightly sticky and slightly plastic; 20 percent gravel; moderately calcareous; moderately alkaline (pH 8.2); clear wavy boundary.

A12—6 to 13 inches; yellowish brown (10YR 5/4) gravelly loam, dark yellowish brown (10YR 4/4) moist; weak fine subangular blocky structure parting to weak fine granular; soft, friable, slightly sticky and slightly plastic; 20 percent gravel; moderately calcareous; strongly alkaline (pH 8.6); abrupt wavy boundary.

R—13 inches; fractured limestone.

Depth to bedrock ranges from 10 to 20 inches.

The A horizon has value of 4 or 5 when moist and chroma of 3 or 4 when moist or dry. It is 20 to 30 percent rock fragments, of which 0 to 20 percent is cobbles and 15 to 30 percent is gravel.

Hival series

The Hival series consists of very deep, poorly drained, very slowly permeable soils on flood plains and alluvial fans. These soils formed in alluvium derived mainly from sandstone and shale. Slopes range from 0 to 2 percent.

These soils are fine, mixed, frigid Aquic Camborthids.

Typical pedon of Hival silty clay loam, about 2,500 feet west and 1,500 feet north of the southeast corner of sec. 23, T. 9 N., R. 7 E.

A1—0 to 5 inches; dark brown (7.5YR 3/4) silty clay loam, brown (7.5YR 4/4) dry; weak medium subangular blocky structure; hard, friable, sticky and plastic; strongly calcareous; moderately alkaline (pH 8.3); clear smooth boundary.

B21—5 to 13 inches; dark brown (7.5YR 4/4) clay, brown (7.5YR 5/4) dry; moderate medium subangular blocky structure; very hard, friable, sticky and plastic; strongly calcareous; moderately alkaline (pH 8.3); clear smooth boundary.

B22—13 to 22 inches; brown (7.5YR 5/4) clay, light brown (7.5YR 6/4) dry; few fine faint mottles; moderate medium subangular blocky structure; very hard, firm, sticky and plastic; strongly calcareous; moderately alkaline (pH 8.4); clear smooth boundary.

C1—22 to 32 inches; reddish brown (5YR 5/4) clay, yellowish red (5YR 5/6) dry; common medium faint mottles; massive; very hard, firm, sticky and plastic; strongly calcareous; moderately alkaline (pH 8.1); clear smooth boundary.

C2—32 to 60 inches; yellowish red (5YR 5/6) clay, reddish yellow (5YR 6/6) dry; few fine faint mottles; massive; very hard, very firm, sticky and plastic; strongly calcareous; moderately alkaline (pH 8.2).

Thickness of the solum is 22 to 33 inches.

The A horizon has hue of 7.5YR or 5YR, value of 3 or 4 when moist and 4 or 5 when dry, and chroma of 4. It is moderately alkaline or strongly alkaline.

The B2 horizon has hue of 5YR or 7.5YR, value of 4 or 5 when moist and 6 or 7 when dry, and chroma of 4 to 6. It is 55 to 65 percent clay.

The C horizon has hue of 5YR or 7.5YR, value of 5 or 6 when moist and 6 or 7 when dry, and chroma of 2 to 6. It commonly is clay that averages 50 to 60 percent clay, but it ranges to silty clay loam below a depth of 40 inches.

Horrocks series

The Horrocks series consists of deep, well drained, moderately permeable soils on mountainsides and uplands. These soils formed in residuum and colluvium derived from conglomerate and sandstone. Slopes range from 6 to 10 percent.

These soils are loamy-skeletal, mixed, frigid Typic Argixerolls.

Typical profile of Horrocks gravelly loam, 6 to 10 percent slopes, about 1,000 feet east and 1,600 feet north of the southwest corner of sec. 10, T. 6 N., R. 6 E.

A11—0 to 6 inches; very dark brown (10YR 2/2) gravelly loam, dark brown (10YR 4/3) dry; weak fine subangular blocky structure; slightly hard, friable; 25 percent gravel and 5 percent cobbles; neutral (pH 6.7); clear wavy boundary.

A12—6 to 11 inches; dark brown (7.5YR 3/2) gravelly loam, dark brown (10YR 4/3) dry; weak medium subangular blocky structure; very hard, firm, slightly sticky and slightly plastic; 20 percent gravel and 5 percent cobbles; neutral (pH 6.8); clear wavy boundary.

B21t—11 to 17 inches; strong brown (7.5YR 4/6) very gravelly sandy clay loam, strong brown (7.5YR 5/6) dry: moderate fine subangular blocky structure; extremely hard, firm, sticky and slightly plastic; 30 percent gravel and 10 percent cobbles; common thin clay films on peds; neutral (pH 6.8); clear wavy boundary.

B22t—17 to 24 inches; reddish brown (5YR 4/4) very gravelly sandy clay loam, reddish brown (5YR 5/4) dry; moderate fine subangular blocky structure; very hard, very firm, sticky and slightly plastic; 30 percent gravel and 10 percent cobbles; common thin clay films on peds; neutral (pH 6.8); abrupt wavy boundary.

C1—24 to 41 inches; reddish brown (5YR 5/4) gravelly sandy loam, yellowish red (5YR 5/6) dry; massive; very hard, very firm; 15 percent gravel; neutral (pH 7.1); abrupt wavy boundary.

R—41 inches; fractured sandstone.

The mollic epipedon is 10 to 15 inches thick. The combined thickness of the A and Bt horizon is 20 to 40 inches. Sandstone bedrock is at a depth of 40 to 60 inches.

The A horizon has hue of 10YR or 7.5YR, value of 2 or 3 when moist, and chroma of 2 or 3 when moist or dry. It is 20 to 35 percent rock fragments, of which 0 to 5 percent is cobbles and 20 to 30 percent is gravel.

The Bt horizon has hue of 7.5YR or 5YR and chroma of 4 to 6 when moist or dry. It is 35 to 50 percent rock fragments, of which 5 to 10 percent is cobbles and 30 to 45 percent is gravel.

The C horizon has chroma of 4 to 6 when moist or dry. It is 15 to 30 percent gravel.

Hourglass series

The Hourglass series consists of deep, well drained, moderately slowly permeable soils on mountainsides. These soils formed in residuum and colluvium derived from limestone. Slopes range from 25 to 50 percent.

These soils are fine-loamy, mixed Argic Cryoborolls.

Typical pedon of Hourglass silt loam, 25 to 50 percent slopes, about 2,200 feet east and 100 feet south of the northwest corner of sec. 2, T. 13 N., R. 4 E.

O1—2 inches to 0; partially decomposed leaves and twigs.
A11—0 to 6 inches; dark brown (7.5YR 3/2) silt loam, yellowish brown (10YR 5/4) dry; weak fine granular structure; soft, very friable, slightly sticky and slightly plastic; 5 percent gravel, 4 percent cobbles, and 1 percent stones; slightly acid (pH 6.4); clear smooth boundary.
A12—6 to 13 inches; dark brown (7.5YR 3/2) gravelly loam, yellowish brown (10YR 5/4) dry; weak fine and medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; 15 percent gravel, 5 percent cobbles, and 1 percent stones; neutral (pH 7.0); gradual irregular boundary.
B2t—13 to 25 inches; dark brown (7.5YR 3/4) cobbly silty clay loam, brown (7.5YR 5/3) dry; moderate medium and coarse subangular blocky structure; hard, firm, slightly sticky and plastic; few thin clay films; 10 percent gravel and 15 percent cobbles; neutral (pH 6.8); diffuse irregular boundary.
C—25 to 41 inches; dark brown (7.5YR 3/3) extremely cobbly loam, brown (7.5YR 5/4) dry; weak fine subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; 70 percent cobbles; slightly calcareous; disseminated carbonates; neutral (pH 7.0); abrupt irregular boundary.
R—41 inches; fractured limestone.

The mollic epipedon is 10 to 15 inches thick. Thickness of the A and Bt horizons is 20 to 30 inches. Depth to bedrock ranges from 40 to 50 inches.

The A horizon has hue of 10YR or 7.5YR and chroma of 2 to 4 when moist or dry. It is 10 to 20 percent rock fragments, of which 10 to 15 percent is gravel and 0 to 5 percent is cobbles.

The Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5 when dry, and chroma of 2 to 4 when moist or dry. It is 20 to 25 percent rock fragments, of which 10 to 20 percent is gravel and 0 to 15 percent is cobbles.

The C horizon has hue of 10YR or 7.5YR, value of 4 or 5 when dry, and chroma of 2 to 4 when moist or dry. It is 55 to 70 percent rock fragments, of which 0 to 30 percent is gravel and 50 to 70 percent is cobbles.

Jebo series

The Jebo series consists of moderately deep, somewhat excessively drained, moderately permeable soils on sides of foothills and mountains. These soils formed in colluvium derived from sandstone or conglomerate. Slopes range from 15 to 40 percent.

These soils are loamy-skeletal, mixed, frigid Calcic Haploxerolls.

Typical pedon of Jebo very gravelly loam, 25 to 40 percent slopes, about 1,700 feet east and 2,100 feet south of the northwest corner of sec. 29, T. 12 N., R. 5 E.

A1—0 to 10 inches; dark brown (7.5YR 3/2) very gravelly loam, brown (7.5YR 5/4) dry; weak fine granular structure; soft, very friable; 35 percent gravel and 5 percent cobbles; slightly calcareous; disseminated carbonates; mildly alkaline (pH 7.6); clear smooth boundary.
B2—10 to 16 inches; brown (7.5YR 4/4) very gravelly loam, light brown (7.5YR 6/4) dry; weak fine subangular blocky structure; soft, friable, slightly sticky and slightly plastic; 30 percent gravel and 15 percent cobbles; moderately calcareous; disseminated carbonates; moderately alkaline (pH 8.4); gradual wavy boundary.
C1ca—16 to 24 inches; brown (7.5YR 5/4) very cobbly loam, light brown (7.5YR 6/4) dry; weak fine subangular blocky structure; soft, friable, slightly sticky and plastic; 35 percent gravel and 25 percent cobbles; strongly calcareous; disseminated carbonates; strongly alkaline (pH 8.8); gradual wavy boundary.
C2ca—24 to 35 inches; reddish yellow (7.5YR 6/6) extremely cobbly sandy loam, pink (7.5YR 7/4) dry; weak fine subangular blocky structure; soft, very friable; 45 percent gravel and 25 percent cobbles; strongly calcareous; disseminated carbonates; moderately alkaline (pH 8.2); abrupt irregular boundary.
R—35 inches; fractured conglomerate.

Depth to bedrock is 20 to 40 inches. The mollic epipedon is 7 to 20 inches thick. Thickness of the solum and depth to free carbonates typically is about 18 inches, but it ranges from 13 to 20 inches. Rock fragments in the 10- to 40-inch control section are rounded. The control section is 40 to 65 percent gravel and 0 to 20 percent cobbles.

The A horizon has hue of 10YR to 7.5YR, value of 4 or 5 when dry and 3 when moist, and chroma of 3 or 4 when dry and 2 or 3 when moist. It is about 40 percent rock fragments, of which 30 to 40 percent is gravel and 0 to 10 percent is cobbles. The A horizon is neutral to moderately alkaline and is noncalcareous or slightly calcareous.

The B2 horizon has hue of 7.5YR to 5YR and value of 5 or 6 when dry and 3 or 4 when moist. It is 35 to 60 percent rock fragments, of which 30 to 60 percent is gravel and 0 to 15 percent is cobbles. The B2 horizon is neutral to moderately alkaline and is noncalcareous to moderately calcareous.

The Cca horizon has hue of 7.5YR to 2.5YR, value of 5 or 7 when dry and 4 to 6 when moist, and chroma of 4 when dry and 4 to 6 when moist. It is very cobbly loam

or extremely cobbly sandy loam to extremely gravelly loam or extremely gravelly sandy loam. The Cca horizon is 35 to 60 percent rock fragments, of which 30 to 55 percent is gravel and 0 to 40 percent is cobbles. It is moderately alkaline or strongly alkaline.

Kamack series

The Kamack series consists of deep, well drained, moderately permeable soils on mountainsides. They formed in residuum derived from sandstone. Slopes range from 30 to 60 percent.

These soils are loamy-skeletal, mixed Typic Cryoborolls.

Typical pedon of Kamack loam, 30 to 60 percent slopes, about 300 feet east and 200 feet south of the northwest corner of sec. 36, T. 8 N., R. 4 E.

O1—2 inches to 0; partially decomposed needles and twigs.
A11—0 to 6 inches; dark brown (10YR 3/2) loam, brown (7.5YR 4/2) dry; weak fine granular structure; soft, friable; neutral (pH 6.6); gradual wavy boundary.
A12—6 to 13 inches; dark brown (10YR 3/3) sandy loam, brown (10YR 5/3) dry; weak fine granular structure; slightly hard, friable; neutral (pH 6.8); gradual wavy boundary.
A2—13 to 20 inches; brown (7.5YR 5/4) sandy loam, pink (7.5YR 7/4) dry; weak fine subangular blocky structure; very hard, firm; 5 percent gravel; neutral (pH 6.8); gradual wavy boundary.
B2—20 to 41 inches; dark reddish brown (5YR 3/4) very gravelly sandy clay loam, light reddish brown (5YR 6/4) dry; moderate medium subangular blocky structure; very hard, firm, slightly sticky and slightly plastic; 25 percent gravel and 10 percent cobbles; strongly calcareous; mildly alkaline (pH 7.4); abrupt smooth boundary.
R—41 inches; fractured sandstone.

The mollic epipedon is 10 to 15 inches thick. Depth to bedrock is 40 to 60 inches.

The A1 horizon has hue of 10YR or 7.5YR, value of 4 or 5 when dry, and chroma of 2 or 3. It is neutral or slightly acid.

The B2 horizon has value of 3 or 4 when moist and 5 or 6 when dry. It is neutral or mildly alkaline.

Kearl series

The Kearl series consists of moderately deep, well drained, moderately permeable soils on uplands and foothills. These soils formed in residuum and colluvium derived from sandstone. Slopes range from 4 to 40 percent.

These soils are coarse-loamy, mixed, frigid Calcic Haploxerolls.

Typical pedon of Kearl loam, 4 to 15 percent slopes, about 1,000 feet east and 2,500 feet north of the southwest corner of sec. 24, T. 14 N., R. 6 E.

A11—0 to 2 inches; dark reddish brown (5YR 3/3) loam, reddish brown (5YR 5/4) dry; weak fine granular structure; soft, very friable; moderately alkaline (pH 8.0); clear smooth boundary.
A12—2 to 13 inches; dark reddish brown (5YR 3/3) loam, reddish brown (5YR 4/4) dry; weak fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; moderately alkaline (pH 8.2); gradual smooth boundary.
B2—13 to 19 inches; dark red (2.5YR 3/6) loam, red (2.5YR 5/8) dry; weak fine and medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; strongly calcareous; disseminated carbonates; moderately alkaline (pH 8.4); gradual wavy boundary.
Cca—19 to 36 inches; red (2.5YR 4/8) fine sandy loam, light red (2.5YR 6/6) dry; massive; hard, friable; strongly calcareous; disseminated carbonates; moderately alkaline (pH 8.4); abrupt irregular boundary.
R—36 inches; sandstone.

Depth to sandstone ranges from 20 to 40 inches. The mollic epipedon is 8 to 16 inches thick. Thickness of the solum and depth to an accumulation of carbonates are 13 to 24 inches. The control section is 7 to 17 percent clay. Soft sandstone fragments that crush under strong thumb pressure are throughout the profile.

The A horizon has hue of 10YR to 5YR, value of 4 or 5 when dry and 3 when moist, and chroma of 3 or 4 when dry and 2 or 3 when moist. It commonly is loam or sandy loam but is silt loam in some pedons. The A horizon is 0 to 15 percent gravel. It is neutral to moderately alkaline and is noncalcareous to moderately calcareous.

The B2 horizon has hue of 7.5YR to 2.5YR, value or 4 to 6 when dry and 3 or 4 when moist, and chroma of 4 to 8 when dry and 3 to 6 when moist. It commonly is loam but is sandy loam in some pedons. The B2 horizon is mildly alkaline to strongly alkaline. It is 0 to 15 percent gravel.

The Cca horizon has hue of 7.5YR to 2.5YR, value of 4 to 7 when dry and 3 to 6 when moist, and chroma of 4 to 6 when dry and 4 to 8 when moist. It is loam, fine sandy loam, or sandy loam. The C horizon is 0 to 15 percent gravel. It is moderately alkaline or strongly alkaline and is strongly calcareous or very strongly calcareous.

Lakridge series

The Lakridge series consists of moderately deep, well drained, moderately permeable soils on foothills. These

soils formed in loess and alluvium derived from mixed parent material. Slopes range from 5 to 10 percent.

These soils are fine-loamy, carbonatic, frigid Petrocalcic Palexerolls.

Typical pedon of Lakridge silt loam, 5 to 10 percent slopes, about 1,350 feet east and 1,900 feet north of the southwest corner of sec. 25, T. 14 N., R. 7 E.

A1—0 to 8 inches; dark brown (10YR 3/3) silt loam, brown (10YR 4/3) dry; weak fine granular structure; soft, friable, slightly plastic; 5 percent gravel; strongly calcareous; disseminated carbonates; moderately alkaline (pH 8.2); clear smooth boundary.

B2—8 to 14 inches; dark yellowish brown (10YR 3/4) silt loam, yellowish brown (10YR 5/4) dry; weak fine subangular blocky structure; soft, friable, slightly sticky and slightly plastic; 5 percent gravel; strongly calcareous; disseminated carbonates; moderately alkaline (pH 8.2); clear smooth boundary.

C1ca—14 to 27 inches; very pale brown (10YR 7/3) loam, very pale brown (10YR 8/3) dry; weak fine and medium subangular blocky structure; slightly hard, friable; 14 percent gravel; very strongly calcareous; disseminated carbonates; moderately alkaline (pH 8.4); abrupt wavy boundary.

C2cam—27 inches; calcium carbonate-cemented hardpan.

Thickness of the solum and depth to free carbonates are 14 to 28 inches. The mollic epipedon is 8 to 14 inches thick. The control section is 0 to 10 percent gravel. Depth to the carbonate-cemented layer is 20 to 40 inches.

The A horizon has value of 4 or 5 when dry and 3 when moist, and it has chroma of 3 or 4 when moist or dry. It is 0 to 5 percent gravel. The A horizon is mildly alkaline or moderately alkaline.

The B horizon has value of 5 or 6 when dry and 3 or 4 when moist, and it has chroma of 3 or 4 when moist or dry. It is loam or silt loam and is 0 to 15 percent gravel.

The C horizon has value of 7 or 8 when dry and 5 to 7 when moist, and it has chroma of 3 or 4 when moist or dry. It is loam or silt loam and is 0 to 15 percent gravel.

Lariat series

The Lariat series consists of moderately deep, well drained, moderately rapidly permeable soils on rolling uplands and foothills. These soils formed in residuum derived from sandstone. Slopes range from 4 to 10 percent.

These soils are coarse-loamy, mixed, frigid Xerollic Calciorthids.

Typical pedon of Lariat fine sandy loam, 4 to 10 percent slopes, on a convex east-facing side slope of 6 percent; about 2 miles south of Neponset Lake; 1,900 feet south and 1,500 feet east of the northwest corner of sec. 15, T. 7 N., R. 7 E.

A11—0 to 3 inches; dark brown (7.5YR 4/4) fine sandy loam, dark brown (7.5YR 3/4) moist; weak fine granular structure; soft, very friable; 5 percent gravel; slightly calcareous; moderately alkaline (pH 8.2); clear wavy boundary.

A12—3 to 9 inches; brown (7.5YR 5/4) fine sandy loam, dark brown (7.5YR 3/4) moist; weak fine subangular blocky structure; soft, very friable; 5 percent gravel; strongly calcareous; strongly alkaline (pH 8.5); clear wavy boundary.

C1ca—9 to 23 inches; pink (7.5YR 7/4) loam; brown (7.5YR 5/4) moist; massive; slightly hard, friable, slightly sticky; 10 percent gravel; strongly calcareous; strongly alkaline (pH 8.8); clear wavy boundary.

C2—23 to 32 inches; light brown (7.5YR 6/4) loam, brown (7.5YR 5/4) moist; massive; hard, firm; 14 percent gravel; strongly calcareous; strongly alkaline (pH 9.0); abrupt wavy boundary.

R—32 inches; hard fractured sandstone.

Thickness of the solum and depth to free carbonates are 7 to 12 inches. Depth to sandstone is 20 to 40 inches.

The A horizon has hue of 10YR, 7.5YR, or 5YR, value of 4 or 5 when dry and 2 or 3 when moist, and chroma of 3 or 4 when moist or dry. It is 0 to 5 percent gravel.

The Cca horizon has hue of 10YR, 7.5YR, or 5YR, value of 5 to 7 when dry and 4 or 5 when moist, and chroma of 3 to 6. It commonly is loam but is fine sandy loam, sandy loam, gravelly fine sandy loam, or cobbly fine sandy loam in some pedons. The Cca horizon is moderately alkaline or strongly alkaline. It is 0 to 20 percent rock fragments, of which 0 to 20 percent is gravel and 0 to 10 percent is cobbles.

The C horizon has hue of 10YR, 7.5YR, or 5YR, value of 5 to 8 when dry and 4 or 5 when moist, and chroma of 3 to 6. It commonly is loam or fine sandy loam but is sandy loam or gravelly loam in some pedons. The C horizon is strongly alkaline or very strongly alkaline. It is 0 to 20 percent rock fragments, of which 0 to 20 percent is gravel and 0 to 5 percent is cobbles.

Lonjon series

The Lonjon series consists of moderately deep, well drained, moderately permeable soils on foothills. These soils formed in residual, colluvial, and eolian deposits derived from sandstone. Slopes range from 2 to 30 percent.

These soils are loamy-skeletal, carbonatic, frigid Typic Calcixerolls.

Typical pedon of Lonjon silt loam, 2 to 10 percent slopes, about 750 feet east and 1,700 feet north of the southwest corner of sec. 1, T. 13 N., R. 6 E.

A1—0 to 10 inches; dark brown (10YR 3/3) silt loam, brown (10YR 4/3) dry; weak fine granular structure; soft, friable, slightly sticky and slightly plastic; 5 percent gravel; slightly calcareous; disseminated carbonates; neutral (pH 7.2); clear wavy boundary.

B2—10 to 16 inches; yellowish brown (10YR 5/4) gravelly silt loam, light yellowish brown (10YR 6/4) dry; moderate fine and medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic: 25 percent gravel; strongly calcareous; disseminated carbonates; mildly alkaline (pH 7.6); clear wavy boundary.

Cca—16 to 30 inches; very pale brown (10YR 7/4) extremely gravelly loam, very pale brown (10YR 8/3) dry; massive; hard, friable, slightly sticky and slightly plastic; 55 percent gravel and 15 percent cobbles; very strongly calcareous; disseminated carbonates; moderately alkaline (pH 8.2); abrupt irregular boundary.

R—30 inches; hard sandstone.

Thickness of the solum is 12 to 20 inches. The mollic epipedon is 7 to 12 inches thick. Depth to bedrock is 20 to 40 inches. The control section averages more than 40 percent calcium carbonate.

The A horizon has hue of 10YR or 7.5YR, value of 4 or 5 when dry and 3 when moist, and chroma of 2 or 3 when dry or moist. It is 0 to 15 percent gravel. The A horizon is neutral to moderately alkaline and is slightly calcareous or moderately calcareous.

The B horizon has hue of 10YR or 7.5YR, value of 5 or 6 when dry and 4 or 5 when moist, and chroma of 2 to 4 when dry or moist. It is gravelly silt loam or gravelly loam and is 20 to 35 percent gravel. The B horizon is slightly alkaline or moderately alkaline.

The C horizon has hue of 10YR or 7.5YR, value of 7 or 8 when dry and 6 or 7 when moist, and chroma of 2 to 4 when dry or moist. It commonly is extremely gravelly loam but is very gravelly loam in some pedons. The C horizon is 40 to 75 percent rock fragments, of which 30 to 55 percent is gravel and 0 to 15 percent is cobbles. It is moderately alkaline or strongly alkaline.

Lucky Star series

The Lucky Star series consists of very deep, well drained, moderately permeable soils on mountainsides. These soils formed in residuum and colluvium derived dominantly from conglomerate and sandstone. Slopes range from 8 to 60 percent. These soils are loamy-skeletal, mixed Cryic Paleborolls.

Typical pedon of Lucky Star gravelly loam, 8 to 25 percent slopes, about 1,000 feet east and 100 feet north of the southwest corner of sec. 11, T. 13 N., R. 4 E.

O1—1 inch to 0; partially decomposed leaves and twigs.

A11—0 to 7 inches; dark brown (7.5YR 3/2) gravelly loam, brown (7.5YR 4/2) dry; weak fine granular structure; soft, very friable, slightly sticky and slightly plastic; 20 percent gravel; neutral (pH 6.8); clear smooth boundary.

A12—7 to 18 inches; dark brown (7.5YR 3/3) gravelly loam, brown (7.5YR 4/3) dry; weak fine subangular blocky structure parting to weak fine granular; soft, very friable, slightly sticky and slightly plastic; 25 percent gravel; neutral (pH 6.8); gradual irregular boundary.

A21—18 to 29 inches; dark brown (7.5YR 4/3) very gravelly loam, brown (7.5YR 5/4) dry; weak fine subangular blocky structure; soft, friable; 30 percent gravel and 15 percent cobbles; neutral (pH 6.6); gradual wavy boundary.

A22—29 to 40 inches; dark brown (7.5YR 4/4) extremely cobbly loam, strong brown (7.5YR 5/5) dry; weak fine subangular blocky structure; soft, friable; 30 percent gravel and 35 percent cobbles; neutral (pH 7.0); gradual wavy boundary.

B2t—40 to 60 inches; brown (7.5YR 4/4) extremely cobbly clay loam, reddish yellow (7.5YR 6/3) dry; weak medium subangular blocky structure; soft, friable, slightly sticky and slightly plastic; 35 percent gravel and 30 percent cobbles; neutral (pH 7.2).

The mollic epipedon is 10 to 18 inches thick. The combined thickness of the A1, A2, and Bt horizons is more than 60 inches.

The A1 horizon has hue of 10YR or 7.5YR, value of 3 or 4 when dry and 2 or 3 when moist, and chroma of 2 or 3 when moist or dry. It is 20 to 25 percent rock fragments, of which 20 to 25 percent is gravel and 0 to 5 percent is cobbles.

The A2 horizon has hue of 7.5YR or 5YR, value of 5 or 7 when dry and 4 to 6 when moist, and chroma of 3 to 6 when moist or dry. It is gravelly fine sandy loam, very gravelly loam, or extremely cobbly loam. The A2 horizon is 40 to 60 percent rock fragments, of which 20 to 40 percent is gravel and 20 to 35 percent is cobbles.

The Bt horizon has hue of 7.5YR, 5YR, or 2.5YR, value of 5 or 6 when dry and 4 or 5 when moist, and chroma of 5 to 8 when dry and 4 to 6 when moist. It is 50 to 70 percent rock fragments, of which 30 to 40 percent is gravel and 20 to 35 percent is cobbles.

Lundy series

The Lundy series consists of shallow, somewhat excessively drained, moderately permeable soils on canyon walls and mountainsides. These soils formed in residuum and colluvium derived from limestone. Slopes range from 25 to 60 percent. These soils are loamy-skeletal, carbonatic, frigid Lithic Calcixerolls.

Typical pedon of a Lundy very gravelly loam, dry, in an area of Lundy, dry-Rock outcrop complex, 25 to 60 percent slopes; about 2,000 feet west and 700 feet north of the southeast corner of sec. 5, T. 12 N., R. 6 E.

A1—0 to 8 inches; dark brown (10YR 3/3) very gravelly loam, brown (10YR 5/3) dry; weak fine granular structure; soft, very friable, slightly plastic; 40 percent gravel and 15 percent cobbles; strongly calcareous; moderately alkaline (pH 8.4); clear wavy boundary.

C1ca—8 to 16 inches; yellowish brown (10YR 5/4) very cobbly loam, light yellowish brown (10YR 6/4) moist; weak medium subangular blocky structure; soft, very friable, slightly plastic; 20 percent gravel and 40 percent cobbles; strongly calcareous; moderately alkaline (pH 8.4); abrupt irregular boundary.

R—16 inches; fractured limestone.

Depth to limestone is 10 to 20 inches. The mollic epipedon is 8 to 13 inches thick.

The A horizon has chroma of 2 or 3 when moist or dry. It is 40 to 60 percent rock fragments, of which 40 to 45 percent is gravel and 0 to 30 percent is cobbles.

The C horizon has value of 5 or 6 when dry and 4 or 5 when moist, and it has chroma of 3 or 4 when moist or dry. It is 60 to 75 percent rock fragments, of which 20 to 70 percent is gravel and 30 to 45 percent is cobbles.

Matheson series

The Matheson series consists of very deep, somewhat poorly drained, moderately rapidly permeable soils on flood plains. These soils formed in wind reworked alluvium derived from mixed parent material. Slopes range from 0 to 2 percent.

These soils are coarse-loamy, mixed, frigid Xerollic Calciorthids.

Typical pedon of Matheson sandy loam, wet, 0 to 2 percent slopes, about 900 feet north and 2,100 feet east of the southwest corner of sec. 16 T. 10 N., R. 7 E.

O1—1 inch to 0; partially decomposed roots and leaves.

A1—0 to 8 inches; dark brown (7.5YR 4/4) sandy loam, brown (7.5YR 5/4) dry; weak fine granular structure; slightly hard, very friable; slightly calcareous; disseminated carbonates; moderately alkaline (pH 8.4); clear smooth boundary.

B2—8 to 23 inches; strong brown (7.5YR 4/6) sandy loam, brown (7.5YR 5/4) dry; weak medium subangular blocky structure; slightly hard, very friable; slightly calcareous; disseminated carbonates; moderately alkaline (pH 8.4); clear smooth boundary.

C1ca—23 to 38 inches; brown (7.5YR 5/4) sandy loam, pink (7.5YR 7/4) dry; massive; slightly hard, very friable; strongly calcareous; disseminated carbonates and filaments of carbonates; strongly alkaline (pH 8.6); clear smooth boundary.

C2ca—38 to 60 inches; brown (7.5YR 5/4) sand, light brown (7.5YR 6/4) dry; few fine faint mottles; single grain; loose; strongly calcareous; disseminated carbonates; strongly alkaline (pH 8.6).

Thickness of the solum and depth to free carbonates are 16 to 23 inches. Depth to a seasonal high water table ranges from 36 to 60 inches.

The O horizon is 0 to 2 inches thick.

The A horizon has hue of 10YR or 7.5YR, value of 3 when moist and 5 when dry, and chroma of 3 or 4.

The B2 horizon has hue of 7.5YR or 5YR, value of 3 or 4 when moist and 5 when dry, and chroma of 4 to 6.

The C horizon has hue of 7.5YR or 5YR, value of 4 or 5 when moist and 5 or 6 when dry, and chroma of 4. The upper part of the C horizon is sandy loam, and the lower part is sand, coarse sand, or gravelly sand. The C horizon is 0 to 15 percent gravel.

McCarey series

The McCarey series consists of moderately deep, well drained, moderately slowly permeable soils on foothills and alluvial fans. These soils formed in residuum and colluvium derived from conglomerate. Slope ranges from 4 to 15 percent.

These soils are fine-loamy, mixed, frigid Calcic Argixerolls.

Typical pedon of a McCarey loam in an area of Cloud Rim, dry-McCarey loams, 4 to 15 percent slopes, about one-half mile west of Sweetwater Golf Course, near the west quarter corner of sec. 4, T. 13 N., R. 5 E.

A1p—0 to 6 inches; very dark grayish brown (10YR 3/2) loam, dark brown (10YR 4/3) dry; weak fine granular structure; soft, friable, slightly sticky and slightly plastic; 5 percent gravel; neutral (pH 6.6); clear smooth boundary.

A12—6 to 10 inches; dark brown (10YR 3/3) heavy loam, dark yellowish brown (10YR 4/3) dry; weak fine subangular blocky structure; soft, friable, slightly sticky and slightly plastic; 5 percent gravel; neutral (pH 6.8); clear smooth boundary.

B21t—10 to 16 inches; dark yellowish brown (10YR 4/4) light clay loam, brown (7.5YR 5/4) dry; moderate medium subangular blocky structure; hard, firm, sticky and plastic; thin continuous clay films; 5 percent gravel; neutral (pH 6.9); gradual wavy boundary.

B22t—16 to 22 inches; dark brown (7.5YR 4/4) light clay loam, brown (7.5YR 5/4) dry; moderate medium subangular blocky structure; hard, firm, sticky and plastic; thin continuous clay films; 5 percent gravel; mildly alkaline (pH 7.6); clear wavy boundary.
C1—22 to 29 inches; dark red (2.5YR 3/6) sandy loam, yellowish red (5YR 5/6) dry; moderate coarse angular blocky structure; hard, very friable; 5 percent gravel; slightly calcareous; disseminated carbonates; mildly alkaline (pH 7.6); abrupt wavy boundary.
R—29 inches; sandstone and conglomerate.

The mollic epipedon is 10 to 15 inches thick. The solum is 15 to 25 inches thick. Depth to bedrock is 25 to 40 inches.

The A horizon has chroma of 2 or 3 when moist or dry. It is 0 to 5 percent gravel.

The Bt horizon has hue of 5YR to l0YR, value of 3 to 5 when moist, and chroma of 3 or 4 when moist or dry. It is clay loam or silty clay loam and is 0 to 5 percent gravel.

The C horizon has hue of 7.5YR to 2.5YR, value of 3 to 6 when moist, and chroma of 4 to 6 when moist or dry. It is fine sandy loam or sandy loam and is 0 to 5 percent gravel.

These soils are a taxadjunct to the McCarey series because part or all of the C horizon has hue of 5YR or redder. This difference, however, does not affect use and management.

Mirror Lake series

The Mirror Lake series consists of very deep, somewhat excessively drained, rapidly permeable soils in mountain basins. These soils formed in alluvium derived dominantly from sandstone and quartzite. Slopes range from 10 to 30 percent.

These soils are sandy-skeletal, mixed Typic Cryorthents.

Typical pedon of a Mirror Lake sandy loam in an area of Mirror Lake-Sambrito sandy loams, 10 to 30 percent slopes, about 1,400 feet north and 1,500 feet east of the southwest corner of sec. 8, T. 10 N., R. 5 E.

O—1 inch to 0; partially decomposed needles and twigs.
A1—0 to 3 inches; black (10YR 2/1) sandy loam, very dark gray (10YR 3/1) dry; weak fine granular structure; soft, very friable; 10 percent gravel; neutral (pH 6.8); abrupt wavy boundary.
C1—3 to 11 inches; dark brown (10YR 3/3) gravelly loamy sand, light yellowish brown (10YR 6/4) dry; soft, very friable; 20 percent gravel; neutral (pH 7.0); gradual wavy boundary.
C2—11 to 33 inches; light yellowish brown (10YR 6/4) very gravelly sand, very pale brown (10YR 7/4) dry; single grain; loose; 45 percent gravel and 10 percent cobbles; neutral (pH 7.2); gradual wavy boundary.
C3—33 to 60 inches; yellowish red (5YR 4/6) very cobbly sand, reddish yellow (5YR 6/6) dry; single grain; loose; 20 percent gravel and 30 percent cobbles; mildly alkaline (pH 7.4).

The O horizon is 1 inch to 2 inches thick.

The A horizon has value of 1 or 2 when moist and chroma of 1 or 2 when moist or dry. It is 5 to 15 percent gravel.

The C horizon has hue of 5YR or 10YR, value of 6 or 7 when dry and 3 to 6 when moist, and chroma of 3 to 6 when moist or dry. It is 35 to 60 percent rock fragments, of which 10 to 30 percent is cobbles and 25 to 50 percent is gravel.

Mult series

The Mult series consists of moderately deep, well drained, moderately slowly permeable soils on mountainsides. These soils formed in residuum and colluvium derived from limestone. Slopes range from 10 to 60 percent.

These soils are fine-loamy, mixed Argic Cryoborolls.

Typical pedon of a Mult loam in an area of Mult-Agassiz complex, 10 to 25 percent slopes, about 500 feet west and 400 feet north of the southeast corner of sec. 15, T. 9 N., R. 4 E.

O1—1 inch to 0; partially decomposed needles and twigs.
A11—0 to 10 inches; dark brown (10YR 3/3) loam, brown (10YR 5/3) dry; weak fine granular structure; soft, friable, slightly sticky and slightly plastic; neutral (pH 7.0); abrupt smooth boundary.
B21t—10 to 23 inches; dark brown (10YR 3/3) clay loam, pale brown (10YR 6/3) dry; weak fine subangular blocky structure; slightly hard, firm, slightly sticky and slightly plastic; neutral (pH 6.6); gradual wavy boundary.
B22t—23 to 38 inches; brown (10YR 5/3) clay loam, light yellowish brown (10YR 6/4) dry; weak fine and medium subangular blocky structure; very hard, firm, slightly sticky and slightly plastic; neutral (pH 6.8); abrupt irregular boundary.
R—38 inches; fractured limestone.

The mollic epipedon is 10 to 15 inches thick. The combined thickness of the A and Bt horizons is 20 to 40 inches.

The A horizon has value of 4 or 5 when dry and chroma of 2 or 3 when moist or dry.

The Bt horizon has value of 3 to 5 when moist and chroma of 3 or 4 when moist or dry. It is slightly acid or neutral.

Murphy series

The Murphy series consists of very deep, well drained, slowly permeable soils on uplands. These soils formed in residuum and colluvium derived from shale. Slopes range from 4 to 30 percent.

These soils are fine, mixed, frigid Calcixerollic Xerochrepts.

Typical pedon of a Murphy clay loam in an area of Murphy-Richville, dry complex, 15 to 30 percent slopes, about 2,350 feet south and 1,000 feet east of the northwest corner of sec. 8, T. 7 N., R. 8 E.

A11—0 to 3 inches; dark brown (7.5YR 3/2) clay loam, brown (7.5YR 4/2) dry; weak fine granular structure; soft, very friable, slightly sticky and slightly plastic; 14 percent gravel; moderately alkaline (pH 8.4); clear smooth boundary.

A12—3 to 10 inches; dark brown (7.5YR 3/4) clay loam, brown (7.5YR 4/4) dry; weak fine subangular blocky structure; hard, firm, sticky and plastic; moderately alkaline (pH 8.4); clear wavy boundary.

B2—10 to 16 inches; reddish brown (5YR 4/4) heavy clay loam, light reddish brown (5YR 6/4) dry; moderate medium subangular blocky structure; very hard, firm, sticky and plastic; moderately calcareous; disseminated carbonates; strongly alkaline (pH 8.6); clear wavy boundary.

C1ca—16 to 30 inches; yellowish red (5YR 4/6) heavy clay loam, reddish yellow (5YR 6/6) dry; moderate medium subangular blocky structure; extremely hard, very firm, sticky and plastic; abundant cicada casts; strongly calcareous; filaments and soft masses of carbonates; strongly alkaline (pH 8.6); clear wavy boundary.

C2ca—30 to 44 inches; yellowish red (5YR 4/6) clay, light reddish brown (5YR 6/4) dry; moderate medium subangular blocky structure; very hard, very firm, sticky and plastic; strongly calcareous; filaments and soft masses of carbonates on ped faces; moderately alkaline (pH 8.4); gradual wavy boundary.

C3—44 to 60 inches; yellowish red (5YR 4/6) heavy clay loam, light reddish brown (5YR 6/4) dry; weak medium subangular blocky structure; very hard, very firm, sticky and plastic; strongly calcareous; filaments of carbonates on ped faces; moderately alkaline (pH 8.4).

Thickness of the solum is 10 to 20 inches. The control section is 0 to 10 percent gravel.

The A horizon has hue of 7.5YR or 5YR, value of 4 or 5 when dry and 3 to 4 when moist, and chroma of 2 to 4 when moist or dry. It is noncalcareous to strongly calcareous.

The B horizon has hue of 2.5YR, 5YR, or 7.5YR, value of 5 or 6 when dry and 3 to 5 when moist, and chroma of 3 to 6 when moist or dry. It is silty clay loam or clay loam and averages 35 to 39 percent clay. The B horizon is moderately alkaline or strongly alkaline.

The C horizon has hue of 2.5YR, 5YR, or 7.5YR, value of 5 to 8 when dry and 3 to 5 when moist, and chroma of 4 to 6 when moist or dry. It commonly is heavy clay loam or clay but is silty clay or silty clay loam in some pedons. The C horizon is 35 to 45 percent clay.

Neponset series

The Neponset series consists of moderately deep, well drained, moderately permeable soils on uplands. These soils formed in residuum derived mainly from sandstone and siltstone. Slopes range from 6 to 10 percent.

These soils are fine-loamy, mixed (calcareous), frigid Xeric Torriorthents.

Typical pedon of Neponset sandy loam, 6 to 10 percent slopes, about 1,500 feet north and 300 feet west of the southeast corner of sec. 11, T. 7 N., R. 7 E.

A1—0 to 6 inches; reddish brown (5YR 5/4) sandy loam, dark reddish brown (5YR 3/4) moist, weak medium subangular blocky structure; soft, very friable, slightly plastic; 10 percent gravel; moderately alkaline (pH 8.2); clear wavy boundary.

C1—6 to 13 inches; light red (2.5YR 6/6) silt loam, red (2.5YR 4/6) moist; weak fine subangular blocky structure; slightly hard, friable, sticky and slightly plastic; strongly calcareous; disseminated carbonates; moderately alkaline (pH 8.4); clear wavy boundary.

C2—13 to 30 inches; light red (2.5YR 6/6) silt loam, red (2.5YR 4/8) moist; weak medium subangular blocky structure; hard, firm, sticky and slightly plastic; 10 percent gravel; very strongly calcareous; disseminated carbonates; strongly alkaline (pH 8.6); abrupt wavy boundary.

R—30 inches; weathered siltstone.

Depth to bedrock is 20 to 40 inches. The control section is 0 to 30 percent gravel.

The A horizon has hue of 10YR, 7.5YR, or 5YR, value of 4 or 5 when dry and 3 when moist, and chroma of 4. It is 0 to 10 percent gravel.

The C horizon has dominant hue of 2.5YR to 7.5YR. It commonly is loam or silt loam but is gravelly loam in some pedons. The C horizon is 0 to 30 percent rock fragments, of which 0 to 25 percent is gravel and 0 to 5 percent is cobbles. It is moderately alkaline or strongly alkaline.

Nevka series

The Nevka series consists of very deep, poorly drained, moderately permeable soils on flood plains. These soils formed in alluvium derived from mixed parent material. Slope ranges from 0 to 1 percent.

These soils are fine-loamy, mixed, frigid Aquic Calciorthids.

Typical pedon of Nevka loam, about 1,400 feet east and 400 feet south of the northwest corner of sec. 15, T. 11 N., R. 7 E.

A1—0 to 8 inches; brown (10YR 4/3) loam, pale brown (10YR 6/3) dry; weak medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; slightly calcareous; moderately alkaline (pH 8.4); clear smooth boundary.

C1ca—8 to 14 inches; very pale brown (10YR 7/3) loam, white (10YR 8/2) dry; weak medium subangular blocky structure; very hard, friable, sticky, and slightly plastic; strongly calcareous; disseminated carbonates; moderately alkaline (pH 8.4); clear smooth boundary.

C2ca—14 to 24 inches; light yellowish brown (10YR 6/4) loam, very pale brown (10YR 7/3) dry; few fine faint mottles; weak medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; strongly calcareous; moderately alkaline (pH 8.0); clear smooth boundary.

C3—24 to 32 inches; light yellowish brown (10YR 6/4) loam, very pale brown (10YR 7/4) dry; few medium faint mottles; massive; slightly hard, friable; slightly calcareous; moderately alkaline (pH 8.2); abrupt smooth boundary.

C4—32 to 42 inches; pale brown (10YR 6/3) fine sand, very pale brown (10YR 7/3) dry; common medium faint mottles; single grain; loose; slightly calcareous; moderately alkaline (pH 8.5); clear smooth boundary.

C5—42 to 60 inches; pale brown (10YR 6/3) sand, very pale brown (10YR 7/3) dry; common medium faint mottles; single grain; loose; slightly calcareous; moderately alkaline (pH 8.5)

The calcic horizon is at a depth of 6 to 22 inches. These soils are saturated with water to a depth of 36 inches 90 days or more when the soil temperature at a depth of 20 inches is more than 41 degrees F.

The A horizon has value of 3 or 4 when moist and 5 or 6 when dry, and it has chroma of 2 or 3 when moist or dry. It is moderately alkaline or strongly alkaline.

The C horizon has value of 4 to 7 when moist and 6 to 8 when dry, and it has chroma of 1 to 6. The upper part of the C horizon is loam, silt loam, or silty clay loam, and the lower part is fine sand or sand. The horizon is moderately alkaline or strongly alkaline.

Obray series

The Obray series consists of very deep, well drained, very slowly permeable soils on foothills and alluvial fans. These soils formed in colluvium and alluvium derived from sandstone and shale. Slopes range from 6 to 25 percent.

These soils are fine, montmorillonitic, frigid Typic Chromoxererts.

Typical pedon of an Obray silty clay loam in an area of Yeates Hollow-Obray complex, 6 to 25 percent slopes, about 1,300 feet west and 1,750 feet south of the northeast corner of sec. 30, T. 14 N., R. 5 E.

A1—0 to 8 inches; very dark brown (10YR 2/2) silty clay loam, dark grayish brown (10YR 4/2) dry; moderate fine subangular blocky structure; hard, firm, sticky and plastic; neutral (pH 6.8); gradual wavy boundary.

C1—8 to 19 inches; dark brown (7.5YR 3/3) clay, brown (10YR 4/3) dry; strong medium angular blocky structure; extremely hard, very firm, very sticky and very plastic; continuous slickensides; neutral (pH 6.6); gradual wavy boundary.

C2—19 to 29 inches; brown (7.5YR 4/3) clay, brown (10YR 4/3) dry; strong coarse subangular blocky structure; extremely hard, very firm, very sticky and very plastic; continuous slickensides; neutral (pH 6.7); gradual wavy boundary.

C3—29 to 41 inches; brown (7.5YR 4/3) clay, brown (10YR 5/3) dry; strong coarse subangular blocky structure; extremely hard, very firm, very sticky and very plastic; continuous slickensides; neutral (pH 6.8); gradual wavy boundary.

C4—41 to 57 inches; brown (7.5YR 5/3) clay, brown (7.5YR 5/4) dry; moderate medium and coarse subangular blocky structure; extremely hard, very firm, very sticky and very plastic; continuous slickensides; neutral (pH 6.8); gradual wavy boundary.

IICca—57 to 63 inches; brown (7.5YR 5/4) gravelly clay, pink (5YR 7/3) dry; massive; slightly hard, friable, slightly sticky and slightly plastic; 30 percent gravel and 5 percent cobbles; moderately calcareous; disseminated carbonates; mildly alkaline (pH 7.8).

The mollic epipedon is about 19 inches thick. Depth to the strongly calcareous material is 50 to 60 inches or more. When the soil is dry, cracks 1/2 inch to 2 inches wide extend from the surface to a depth of 40 inches or more.

The A horizon has hue of 10YR or 7.5YR, value of 3 or 4 when dry and 2 or 3 when moist, and chroma of 2 or 3 when moist or dry. It is 0 to 10 percent gravel.

The C horizon has hue of 10YR, 7.5YR, or 5YR, value of 3 to 6 when dry and 3 to 5 when moist, and chroma of 3 or 4 when dry and 3 to 6 when moist. It is 0 to 15 percent gravel.

The IIC horizon has hue of 10YR, 7.5YR, or 5YR, value of 7 or 8 when dry and 5 to 7 when moist, and chroma of 2 to 4 when moist or dry. It is 15 to 35 percent rock fragments, of which 20 to 30 percent is gravel and 0 to 10 percent is cobbles.

Pancheri series

The Pancheri series consists of very deep, well drained, moderately permeable soils on foothills and mountainsides. These soils formed in loess derived from mixed parent material. Slopes range from 1 to 50 percent.

These soils are coarse-silty, mixed, frigid Xerollic Calciorthids.

Typical pedon of Pancheri silt loam, cool, 5 to 10 percent slopes, about 2,500 feet west and 1,000 feet south of the northeast corner of sec. 12, T. 12 N., R. 7 E.

A11—0 to 2 inches; yellowish brown (10YR 5/4) silt loam, dark brown (10YR 3/3) moist; weak fine granular structure; soft, friable; slightly calcareous; disseminated carbonates; moderately alkaline (pH 8.2); clear smooth boundary.

A12—2 to 6 inches; yellowish brown (10YR 5/4) silt loam, dark yellowish brown (10YR 3/4) moist; moderate medium subangular blocky structure; soft, friable, slightly sticky and slightly plastic; slightly calcareous; disseminated carbonates; moderately alkaline (pH 8.4); clear wavy boundary.

B2—6 to 22 inches; brown (7.5YR 5/4) silt loam, dark brown (7.5YR 4/4) moist; moderate medium subangular blocky structure; slightly hard, friable, sticky and plastic; moderately calcareous; disseminated carbonates; strongly alkaline (pH 8.6); clear smooth boundary.

C1ca—22 to 42 inches; light brown (7.5YR 6/4) silt loam, brown (7.5YR 5/4) moist; moderate medium angular and subangular blocky structure; very hard, friable, sticky and plastic; strongly calcareous; filaments of carbonates; strongly alkaline (pH 8.9); clear wavy boundary.

C2—42 to 60 inches; light brown (7.5YR 6/4) silt loam, dark yellowish brown (10YR 4/4) moist; moderate medium subangular blocky structure; hard, friable, sticky and plastic; moderately calcareous; disseminated carbonates; strongly alkaline (pH 8.8).

Thickness of the solum is 10 to 28 inches.

The A horizon has hue of 10YR or 7.5YR, value of 4 to 6 when dry and 3 to 5 when moist, and chroma of 2 to 4 when moist or dry. It is 0 to 10 percent gravel.

The B horizon has hue of 10YR or 7.5YR, value of 5 to 8 when dry and 3 to 6 when moist, and chroma of 2 to 4 when moist or dry. It is 0 to 5 percent gravel.

The C horizon has hue of 10YR or 7.5YR, value of 5 to 8 when dry, 4 to 7 when moist, and chroma of 2 to 4 when moist or dry. It is 0 to 10 percent gravel.

Ramshorn series

The Ramshorn series consists of very deep, somewhat excessively drained, moderately rapidly permeable soils on toe slopes. These soils formed in alluvium and colluvium derived from limestone. Slopes range from 8 to 15 percent.

These soils are loamy-skeletal, carbonatic, frigid Xeric Torriorthents.

Typical pedon of Ramshorn gravelly loam, 8 to 15 percent slopes, about 2,500 feet north and 1,600 feet west of the southeast corner of sec. 3, T. 10 N., R. 7 E.

A1—0 to 3 inches; brown (10YR 5/3) gravelly loam, dark brown (10YR 3/3) moist; weak fine granular structure; soft, very friable; slightly sticky and slightly plastic; 20 percent gravel and 8 percent cobbles; slightly calcareous; strongly alkaline (pH 8.6); clear smooth boundary.

C1—3 to 20 inches; pale brown (10YR 6/3) extremely gravelly sandy loam, brown (10YR 5/3) moist; massive; soft, very friable; 60 percent gravel and 15 percent cobbles; very strongly calcareous; coatings of carbonates on rock fragments; strongly alkaline (pH 8.7); clear smooth boundary.

C2—20 to 30 inches; pale brown (10YR 6/3) extremely gravelly sandy loam, brown (10YR 5/3) moist; massive; slightly hard, very friable; 50 percent gravel and 15 percent cobbles; very strongly calcareous; coatings of carbonates on rock fragments; strongly alkaline (pH 8.6); gradual smooth boundary.

C3—30 to 60 inches; pale brown (10YR 6/3) very gravelly sandy loam, brown (10YR 5/3) moist; massive; slightly hard, very friable; 40 percent gravel; very strongly calcareous; coatings of carbonates on undersides of rock fragments; very strongly alkaline (pH 9.2).

Depth to the very gravelly layer is 2 to 15 inches.

The A horizon has value of 5 or 6 when dry. It is 15 to 30 percent rock fragments, of which 15 to 25 percent is gravel and 0 to 10 percent is cobbles.

The C horizon has value of 5 to 7 when dry and 4 or 5 when moist, and it has chroma of 2 to 4. It is 45 to 80 percent rock fragments, of which 40 to 75 percent is gravel and 10 to 25 percent is cobbles. The C horizon is strongly alkaline or very strongly alkaline.

Ramshorn Variant

The Ramshorn Variant consists of moderately deep, well drained, moderately rapidly permeable soils on foothills and stream-cut valley sides. These soils formed in residuum and colluvium derived from limestone. Slopes range from 2 to 40 percent.

These soils are loamy-skeletal, carbonatic, frigid Xeric Torriorthents.

Typical pedon of a Ramshorn Variant gravelly loam in an area of Ramshorn Variant-Highams complex, 2 to 15 percent slopes, about 1,250 feet south and 1,300 feet west of the northeast corner of sec. 34, T. 12 N., R. 6 E.

A11—0 to 6 inches; light brownish gray (10YR 6/2) gravelly heavy loam, brown (10YR 4/3) moist; weak medium subangular blocky structure parting to weak fine granular; soft, friable, slightly sticky and slightly plastic; 15 percent gravel; strongly calcareous; disseminated carbonates; mildly alkaline (pH 8.4); clear smooth boundary.

A12—6 to 10 inches; brown (10YR 5/3) gravelly heavy loam, brown (10YR 5/3) moist; weak fine granular structure; soft, friable, slightly sticky; 20 percent gravel; strongly calcareous; filaments of carbonates; strongly alkaline (pH 8.5); clear smooth boundary.

C1—10 to 24 inches; white (10YR 8/1) very gravelly loam, light gray (10YR 7/2) moist; massive; hard, friable, slightly sticky and slightly plastic; 55 percent gravel; strongly calcareous; filaments of carbonates; strongly alkaline (pH 8.7); gradual smooth boundary.

C2—24 to 35 inches; white (2.5YR 8/2) extremely gravelly loam, light gray (10YR 7/2) moist; massive; very hard, friable, slightly sticky; 70 percent gravel; strongly calcareous; filaments of carbonates; strongly alkaline (pH 8.6); abrupt smooth boundary.

R—35 inches; limestone.

Depth to the very gravelly layer is 5 to 15 inches. Depth to bedrock is 20 to 40 inches.

The A horizon has hue of 5 to 7 when dry and 3 to 6 when moist, and it has chroma of 2 or 3 when moist or dry. It is 15 to 35 percent gravel.

The C horizon has value of 5 to 8 when dry and 3 to 6 when moist, and it has chroma of 1 to 3 when moist or dry. It is 50 to 80 percent gravel.

Ranruff series

The Ranruff series consists of shallow, somewhat excessively drained, moderately permeable soils on foothills. These soils formed in residuum and colluvium derived from sandstone. Slopes range from 30 to 60 percent.

These soils are loamy, mixed (calcareous), frigid Lithic Xeric Torriorthents.

Typical pedon of a Ranruff gravelly loam in an area of Solak-Ranruff-Rock outcrop complex, 30 to 60 percent slopes, about 1,000 feet east and 1,250 feet south of the northwest corner of sec. 2, T. 9 N., R. 6 E.

A1—0 to 5 inches; reddish yellow (5YR 6/6) gravelly loam, yellowish red (5YR 4/6) moist; weak fine granular structure; soft, very friable, sticky and slightly plastic; 20 percent gravel; strongly calcareous; disseminated carbonates; strongly alkaline (pH 9.0); gradual wavy boundary.

C1—5 to 16 inches; light red (2.5YR 6/6) gravelly loam, yellowish red (5YR 5/6) moist; weak fine and medium subangular blocky structure; hard, firm, sticky and slightly plastic; 20 percent gravel; strongly calcareous; disseminated carbonates; strongly alkaline (pH 8.9); abrupt wavy boundary.

R—16 inches; fractured sandstone.

Depth to bedrock is 10 to 20 inches. The ochric epipedon is 4 to 6 inches thick. The control section is 15 to 35 percent rock fragments, of which 15 to 25 percent is gravel, 0 to 5 percent is cobbles, and 0 to 5 percent is stones. The profile is 0 to 40 percent soft gravel, and the content increases with depth.

The A horizon has hue of 2.5YR, 5YR, or 7.5YR, value of 5 or 6 when dry, and chroma of 4 to 8 when dry and 3 to 6 when moist. It is 15 to 30 percent rock fragments, of which 15 to 30 percent is gravel and 0 to 5 percent is stones. The A horizon is moderately alkaline or strongly alkaline and is moderately calcareous or strongly calcareous.

The C horizon has hue of 2.5YR or 5YR, value of 5 or 6 when dry and 3 to 5 when moist, and chroma of 4 to 6 when moist or dry. It is 20 to 35 percent rock fragments, of which 20 to 35 percent is gravel and 0 to 10 percent is cobbles. The C horizon is moderately alkaline or strongly alkaline and is moderately calcareous or strongly calcareous.

Rexmont series

The Rexmont series consists of shallow and very shallow, somewhat excessively drained, moderately permeable soils on mountainsides and ridgetops. These soils formed in residuum derived from limestone. Slopes range from 6 to 70 percent.

These soils are loamy-skeletal, mixed, frigid Lithic Haploxerolls.

Typical pedon of a Rexmont gravelly loam in an area of Rexmont-Rock outcrop complex, 25 to 70 percent slopes, about 1,650 feet west and 1,500 feet south of the northeast corner of sec. 32, T. 11 N., R. 8 E.

A11—0 to 8 inches; brown (10YR 4/3) gravelly loam, dark brown (10YR 3/3) moist; weak fine subangular blocky structure parting to weak fine granular; soft, friable, slightly sticky and slightly plastic; 30 percent gravel; moderately alkaline (pH 8.1); gradual smooth boundary.

A12—8 to 15 inches; brown (10YR 4/3) very cobbly loam, dark brown (10YR 3/3) moist; moderate fine subangular blocky structure parting to weak fine granular; slightly hard, friable, slightly sticky and slightly plastic; 20 percent gravel and 20 percent cobbles; moderately calcareous; disseminated carbonates; strongly alkaline (pH 8.5); clear wavy boundary.

R—15 inches; limestone.

Thickness of the mollic epipedon and depth to bedrock are 8 to 20 inches. The control section is 35 to 60 percent angular rock fragments, of which 25 to 40 percent is gravel and 0 to 35 percent is cobbles.

The A12 horizon is very gravelly loam or very cobbly loam. The A horizon has value of 4 to 5 when dry and chroma of 3 to 4 when moist or dry. It is moderately alkaline or strongly alkaline and is noncalcareous to moderately calcareous.

Rich series

The Rich series consists of very deep, moderately well drained and somewhat poorly drained, slowly permeable soils on flood plains. These soils formed in alluvium derived from mixed parent material. Slopes range from 0 to 2 percent.

These soils are fine, montmorillonitic Udic Natriborolls.

Typical pedon of Rich silt loam, about 200 feet north and 1,000 feet west of the southeast corner of sec. 18, T. 12 N., R. 8 E.

A1—0 to 2 inches; dark brown (10YR 4/3) silt loam, brown (10YR 5/3) dry; weak medium platy structure; slightly hard, very friable, slightly sticky and slightly plastic; strongly calcareous; moderately alkaline (pH 8.0); abrupt smooth boundary.

B21t—2 to 14 inches; black (10YR 2/1) clay, very dark grayish brown (10YR 3/2) dry; strong medium prismatic structure parting to strong medium subangular blocky; hard, very firm, sticky and plastic; many thin clay films on peds; moderately alkaline (pH 8.0); clear wavy boundary.

B22tcacs—14 to 19 inches; very dark gray (10YR 3/1) clay, very dark grayish brown (10YR 3/2) dry; moderate medium prismatic structure parting to strong medium subangular blocky; slightly hard, firm, sticky and plastic; few thin clay films on peds; strongly calcareous; disseminated carbonates; very strongly alkaline in the lower 4 inches (pH 9.1); abrupt irregular boundary.

C1cacs—19 to 38 inches; brown (10YR 4/3) loam, very pale brown (10YR 7/3) dry; massive; slightly hard, friable, slightly sticky and plastic; strongly calcareous; disseminated carbonates; very strongly alkaline (pH 9.5); clear smooth boundary.

C2—38 to 60 inches; brown (10YR 5/3) loam, pale brown (10YR 6/3) dry; massive; slightly hard, friable, slightly sticky and plastic; strongly calcareous; strongly alkaline (pH 9.0).

Thickness of the solum typically is 16 to 25 inches, but it ranges from 16 to 32 inches. The natric horizon has a sodium absorption ratio of 13 to 50. A seasonal water table is between the depths of 24 to 72 inches.

The A horizon has hue of 10YR, value of 2 or 3 when moist and 4 or 5 when dry, and chroma of 1 to 3 when moist or dry. It is silt loam or loam. It is moderately alkaline or strongly alkaline.

The upper part of the B2t horizon has hue of 10YR, value of 2 or 3 when moist and 3 or 4 when dry, and chroma of 1 when moist and 1 or 2 when dry. The lower part has value of 3 or 4 when moist and 3 to 6 when dry, and it has chroma of 1 or 2 when moist or dry.

The B2t horizon is clay or silty clay and is 45 to 60 percent clay. The upper part is moderately alkaline or strongly alkaline, and the lower part is strongly alkaline or very strongly alkaline. The lower part of the B2t horizon has a sodium absorption ratio of 13 to 50.

The C horizon has hue of 10YR, value of 4 or 5 when moist and 6 or 7 when dry, and chroma of 2 to 4 when moist or dry. It commonly is loam or fine sandy loam, but some pedons have strata of silt loam or sand.

Richens series

The Richens series consists of very deep, well drained, slowly permeable soils on mountainsides. These soils formed in residuum and colluvium derived from sandstone. Slopes range from 10 to 60 percent.

These soils are fine, montmorillonitic Argic Pachic Cryoborolls.

Typical pedon of Richens loam, 10 to 30 percent slopes, about 2,400 feet east and 200 feet north of the southwest corner of sec. 12, T. 9 N., R. 4 E.

A11—0 to 4 inches; very dark grayish brown (10YR 3/2) loam, dark grayish brown (10YR 4/2) dry; weak fine granular structure; hard, firm, slightly sticky; neutral (pH 7.0); abrupt smooth boundary.

A12—4 to 24 inches; very dark grayish brown (10YR 3/2) loam, grayish brown (10YR 5/2) dry; weak fine subangular blocky structure; very hard, friable, slightly sticky and slightly plastic; neutral (pH 7.0); gradual wavy boundary.

B2t—24 to 60 inches; dark reddish brown (2.5YR 3/4) clay, pale red (2.5YR 6/2) dry; strong medium subangular blocky structure; extremely hard, very firm, sticky and plastic; neutral (pH 7.0).

The mollic epipedon is 20 to 25 inches thick. The combined thickness of the A1 and Bt horizons is more than 50 inches.

The A horizon has value of 4 or 5 when dry and chroma of 2 or 3 when moist or dry.

The Bt horizon has value of 3 or 4 when moist and 5 or 6 when dry, and it has chroma of 2 to 4 when moist or dry.

Richville series

The Richville series consists of moderately deep, well drained, moderately slowly permeable soils on uplands and mountainsides. These soils formed in residuum and

colluvium derived from sandstone and siltstone. Slopes range from 4 to 40 percent.

These soils are fine-loamy, mixed, frigid Calcixerollic Xerochrepts.

Typical pedon of Richville loam, dry, 8 to 15 percent slopes, about 600 feet east and 2,900 feet north of the southwest corner of sec. 2, T. 8 N., R. 6 E.

A1—0 to 5 inches; dark brown (7.5YR 3/4) loam, brown (7.5YR 4/4) dry; weak fine subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; 10 percent gravel; moderately alkaline (pH 8.3); clear smooth boundary.

B2—5 to 11 inches; yellowish red (5YR 4/6) gravelly loam, yellowish red (5YR 5/6) dry; weak fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; 16 percent gravel; strongly calcareous; moderately alkaline (pH 8.4); clear smooth boundary.

C1ca—11 to 17 inches; yellowish red (5YR 4/6) gravelly clay loam, yellowish red (5YR 5/6) dry; weak coarse subangular blocky structure; hard, firm, slightly sticky and slightly plastic; 18 percent gravel; strongly calcareous; carbonates on undersides of rock fragments and in filaments; strongly alkaline (pH 8.7); clear smooth boundary.

C2ca—17 to 34 inches; yellowish red (5YR 5/6) gravelly clay loam, reddish yellow (5YR 6/6) dry; massive; hard, firm, slightly sticky and slightly plastic; 25 percent gravel; strongly calcareous; carbonates on undersides of rock fragments and in filaments; strongly alkaline (pH 8.7); clear smooth boundary.

Cr—34 inches; weathered sandstone.

Weathered siltstone or sandstone is at a depth of 20 to 40 inches.

The A horizon has hue of 5YR, 7.5YR, or 10YR, value of 4 to 6 when dry and 3 or 4 when moist, and chroma of 2 to 6 when moist or dry. It is 0 to 10 percent gravel and is moderately alkaline or strongly alkaline.

The B horizon has hue of 10YR, 7.5YR, or 5YR, value of 5 to 7 when dry and 4 to 6 when moist, and chroma of 2 to 8 when moist or dry. It is loam, clay loam, or gravelly clay loam and is 5 to 20 percent gravel. The B horizon is moderately alkaline or strongly alkaline.

The C horizon has hue of 7.5YR, 5YR, or 2.5YR, value of 6 or 7 when dry and 4 to 6 when moist, and chroma of 2 to 6 when moist or dry. It is loam or clay loam and is 5 to 25 percent gravel. The C horizon is moderately alkaline or strongly alkaline.

Saleratus series

The Saleratus series consists of very deep, poorly drained, slowly permeable soils on flood plains. These soils formed in alluvium derived from mixed parent material. Slopes range from 0 to 2 percent.

These soils are fine-silty, mixed (calcareous), frigid Aquic Ustifluvents.

Typical pedon of Saleratus loam, about 2,300 feet north 1,700 feet east of the southwest corner of sec. 32, T. 11 N., R. 7 E.

A1—0 to 6 inches; dark grayish brown (10YR 4/2) loam, pale brown (10YR 6/3) dry; weak medium platy structure; slightly hard, very friable, slightly sticky and slightly plastic; strongly calcareous; strongly alkaline (pH 8.6); clear smooth boundary.

C1—6 to 17 inches; dark yellowish brown (10YR 4/4) loam, light yellowish brown (10YR 6/4) dry; weak medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; strongly calcareous; strongly alkaline (pH 8.6); clear smooth boundary.

A1b—17 to 23 inches; dark brown (10YR 4/3) silt loam, brown (10YR 5/3) dry; weak medium subangular blocky and granular structure; hard, friable, slightly sticky and slightly plastic; strongly calcareous; strongly alkaline (pH 8.4); gradual wavy boundary.

C2b—23 to 45 inches; strong brown (7.5YR 5/6) silt loam, reddish yellow (7.5YR 7/6) dry; common medium faint mottles and few medium distinct mottles; weak medium subangular blocky structure; hard, firm, slightly sticky and slightly plastic; strongly calcareous; strongly alkaline (pH 8.4); abrupt smooth boundary.

A1b—45 to 60 inches; dark grayish brown (10YR 4/2) silty clay loam, grayish brown (10YR 5/2) dry; weak medium subangular blocky structure; very hard, very firm, sticky and plastic; strongly calcareous; strongly alkaline (pH 8.6).

Depth to a seasonal high water table ranges from 18 to 30 inches. Some part of the profile is saturated for at least a few days when the soil temperature is about 41 degrees F.

The A horizon has hue of 10YR, 7.5YR, or 5YR, value of 3 to 5 when moist and 4 to 6 when dry, and chroma of 2 to 6 when moist or dry. It is moderately alkaline to very strongly alkaline.

The C1 and C2 horizons have hue of 10YR, 7.5YR, or 5YR, value of 3 to 6 when moist and 5 to 7 when dry, and chroma of 2 to 6 when moist or dry. They commonly are silt loam or silty clay loam but are loam in some pedons. The horizons are moderately alkaline to very strongly alkaline.

The Ab horizon, where present, has hue of 10YR, 7.5YR, or 5YR, value of 4 to 6 when moist and 5 to 7 when dry, and chroma of 2 to 6 when moist or dry. It is silt loam or silty clay loam.

Saleratus Variant

The Saleratus Variant series consists of very deep, somewhat poorly drained, rapidly permeable soils on

lakeshores. These soils formed in beach deposits derived from mixed parent material. Slopes range from 0 to 2 percent.

These soils are mixed, frigid Aquic Ustipsamments.

Typical pedon of a Saleratus Variant loamy fine sand in an area of Saleratus Variant-Canburn Variant complex, about 2,500 feet east and 150 feet south of the northwest corner of sec. 25, T. 13 N., R. 5 E.

A1—0 to 3 inches; brown (10YR 4/3) loamy fine sand, brown (10YR 5/3) dry; single grain; loose; 2 percent gravel; moderately calcareous; soft masses of carbonates; mildly alkaline (pH 7.4); clear smooth boundary.

C1—3 to 20 inches; brown (10YR 4/3) very fine sand and fine sand, brown (10YR 5/3) dry; single grain; loose; 2 percent gravel; strongly calcareous; soft masses of carbonates; mildly alkaline (pH 7.6); clear smooth boundary.

C2—20 to 30 inches; brown (10YR 4/3) medium sand, brown (10YR 5/3) dry; single grain; loose; 5 percent gravel; strongly calcareous; soft masses of carbonates; moderately alkaline (pH 8.0); abrupt smooth boundary.

C3—30 to 60 inches; brown (10YR 4/3) stratified gravelly fine sand, gravelly coarse sand, and medium sand, brown (10YR 5/3) dry; single grain; loose; 10 to 35 percent gravel; strongly calcareous; soft masses of carbonates; mildly alkaline (pH 7.6).

The profile is 5 to 30 percent gravel. The water table fluctuates between depths of 12 and 36 inches.

The A horizon has value of 4 or 5 when dry and 3 or 4 when moist and chroma of 2 or 3.

The C horizon has value of 5 when dry and 4 when moist, and it has chroma of 3 or 4. It is fine sand or very fine sand in the upper part and is gravelly coarse sand, gravelly fine sand, or medium sand in the lower part. The C horizon is slightly alkaline to strongly alkaline.

Sambrito series

The Sambrito series consists of very deep, well drained, moderately permeable soils on mountainsides. These soils formed in colluvium derived from sandstone. Slopes range from 10 to 60 percent.

These soils are coarse-loamy, mixed Typic Cryochrepts.

Typical pedon of Sambrito sandy loam, 25 to 60 percent slopes, about 1,200 feet west and 1,550 feet north of the southeast corner of sec. 21, T. 11 N., R. 5 E.

O1—1 inch to 0; partially decomposed leaves and twigs.

A1—0 to 2 inches; very dark grayish brown (10YR 3/2) sandy loam, brown (10YR 5/3) dry; weak very fine granular structure; soft, very friable; slightly acid (pH 6.4); clear smooth boundary.

B2—2 to 31 inches; dark brown (10YR 4/4) fine sandy loam, light yellowish brown (10YR 6/4) dry; weak fine subangular blocky structure parting to weak fine granular; soft, very friable; neutral (pH 6.6); diffuse irregular boundary.

C1—31 to 41 inches; dark brown (7.5YR 4/4) sandy loam, light brown (7.5YR 6/4) dry; weak fine subangular blocky structure parting to weak fine granular; soft, very friable; neutral (pH 7.2); diffuse irregular boundary.

C2—41 to 60 inches; strong brown (7.5YR 4/6) loamy sand, light brown (7.5YR 6/4) dry; single grain; loose; neutral (pH 7.0).

The ochric epipedon is 2 to 6 inches thick. Thickness of the solum is 10 to 31 inches. Soft sandstone fragments that crush under strong thumb pressure are throughout the profile, but their content increases as depth increases.

The A horizon has hue of 7.5YR or 10YR, value of 2 to 4 when moist and 4 to 6 when dry, and chroma of 2 or 3 when moist or dry. It is slightly acid or neutral.

The B horizon has hue of 7.5YR or 10YR, value of 3 or 4 when moist, and 6 or 7 when dry. It is sandy loam or fine sandy loam and is slightly acid or neutral. The B horizon is 0 to 10 percent gravel.

The C horizon has hue of 2.5YR to 7.5YR, value of 3 to 5 when moist and 5 to 7 when dry, and chroma of 4 to 6 when moist or dry. It is fine sandy loam, sandy loam, or loamy sand. The C horizon is slightly acid to mildly alkaline and is noncalcareous to slightly calcareous. It is 0 to 15 percent gravel.

Scout series

The Scout series consists of very deep, well drained, moderately rapidly permeable soils on mountainsides. These soils formed in residuum and colluvium derived from quartzite and sandstone. Slopes range from 10 to 40 percent.

These soils are loamy-skeletal, mixed Typic Cryochrepts.

Typical pedon of Scout very stony loam, 10 to 40 percent slopes, about 9,000 feet west and 4,000 feet north of Swan Peak.

O1—2 inches to 0; mat of conifer needles, twigs, and leaves.

A1—0 to 4 inches; dark brown (7.5YR 3/2) very stony loam, brown (10YR 5/3) dry; weak fine granular structure; soft, friable, slightly sticky and slightly plastic; 5 percent gravel, 5 percent cobbles, and 15 percent stones; slightly acid (pH 6.4); clear smooth boundary.

A2—4 to 21 inches; dark brown (10YR 3/3) very stony loam, pale brown (10YR 6/3) dry; weak fine and medium subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; 15 percent gravel, 10 percent cobbles, and 25 percent stones; slightly acid (pH 6.5); gradual wavy boundary.

B2—21 to 31 inches; brown (7.5YR 4/4) very cobbly loam, pink (7.5YR 7/4) dry; weak medium and coarse subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; 20 percent gravel and 25 percent cobbles; slightly acid (pH 6.4); gradual wavy boundary.

C1—31 to 46 inches; reddish yellow (7.5YR 6/6) very cobbly very fine sandy loam, reddish yellow (7.5YR 7/6) dry; massive; soft, very friable; 20 percent gravel and 25 percent cobbles; slightly acid (pH 6.4); clear wavy boundary.

C2—46 to 60 inches; strong brown (7.5YR 5/6) extremely cobbly very fine sandy loam, reddish yellow (7.5YR 7/6) dry; massive; soft, very friable; 30 percent gravel and 40 percent cobbles; slightly acid (pH 6.4).

The combined thickness of the A1, A2, and B2 horizons is 30 to 35 inches.

The A1 horizon has hue of 10YR or 7.5YR. It is 25 to 55 percent rock fragments, of which 5 to 25 percent is gravel, 5 to 20 percent is cobbles, and 10 to 15 percent is stones. The A2 horizon has hue of 10YR or 7.5YR, value of 3 or 4 when moist, and chroma of 3 or 4 when moist or dry. It is 45 to 50 percent rock fragments, of which 15 to 35 percent is gravel, 10 to 15 percent is cobbles, and 0 to 25 percent is stones.

The B horizon has value of 5 to 7 when dry. It is very gravelly loam or very cobbly loam. The B horizon is 45 to 55 percent rock fragments, of which 20 to 35 percent is gravel and 15 to 30 percent is cobbles.

The C horizon has value of 6 or 7 when dry and 4 to 6 when moist, and it has chroma of 4 to 6 when moist or dry. It is very cobbly sandy loam or very cobbly very fine sandy loam. The C horizon is 45 to 70 percent rock fragments, of which 25 to 30 percent is gravel and 20 to 40 percent is cobbles.

Searla series

The Searla series consists of deep, well drained, moderately slowly permeable soils on cinder cones. These soils formed in colluvium and residuum derived from basalt. Slopes range from 8 to 25 percent.

These soils are loamy-skeletal, mixed, frigid Calcic Argixerolls.

Typical pedon of Searla very gravelly silt loam, 8 to 25 percent slopes, about 1,100 feet west and 1,500 feet south of the northeast corner of sec. 14, T. 14 N., R. 6 E.

A11—0 to 3 inches; very dark brown (7.5YR 2/2) very gravelly silt loam, dark brown (7.5YR 3/2) dry; weak fine granular structure; soft, very friable, slightly sticky and slightly plastic; 45 percent gravel; moderately alkaline (pH 8.0); clear smooth boundary.

A12—3 to 8 inches; very dark brown (7.5YR 2/2) very gravelly silt loam, dark brown (7.5YR 3/3) dry; weak fine subangular blocky structure; slightly hard, friable, slightly sticky and plastic; 60 percent gravel; moderately alkaline (pH 8.0); clear smooth boundary.

B21t—8 to 16 inches; dark brown (7.5YR 3/2) extremely gravelly silty clay loam, brown (7.5YR 4/2) dry; strong fine subangular blocky structure; extremely hard, very firm, slightly sticky and plastic; common thin clay films; 70 percent gravel; moderately alkaline (pH 8.0); clear wavy boundary.

B22t—16 to 24 inches; dark brown (7.5YR 3/4) extremely gravelly silty clay loam, brown (7.5YR 4/2) dry; strong fine and medium subangular blocky structure; extremely hard, very firm, sticky and plastic; many thin clay films; 60 percent gravel; moderately alkaline (pH 8.2); gradual wavy boundary.

Cca—24 to 41 inches; brown (7.5YR 5/4) very gravelly heavy silt loam, light reddish brown (7.5YR 6/3) dry; moderate fine subangular blocky structure; hard, friable, slightly sticky and plastic; 55 percent gravel; strongly calcareous; soft masses of carbonates; moderately alkaline (pH 8.2); abrupt wavy boundary.

R—41 inches; fractured basalt.

The mollic epipedon is 8 to 16 inches thick. The solum is 24 to 30 inches thick. Depth to bedrock is 40 to 60 inches.

The A horizon has value of 3 or 4 when dry and 2 or 3 when moist, and it has chroma of 2 or 3 when moist or dry. It is 35 to 60 percent rock fragments, of which 35 to 55 percent is gravel and 0 to 5 percent is cobbles.

The Bt horizon has hue of 10YR or 7.5YR, value of 4 to 7 when dry and 3 to 5 when moist, and chroma of 2 to 4 when moist or dry. It is 60 to 75 percent rock fragments, of which 50 to 75 percent is gravel and 5 to 15 percent is cobbles.

The C horizon has hue of 10YR or 7.5YR, value of 6 or 7 when dry and 5 or 6 when moist, and chroma of 2 to 4 when moist or dry. It is 30 to 55 percent gravel.

Slinger series

The Slinger series consists of moderately deep, somewhat excessively drained, moderately permeable soils on foothills. These soils formed in residuum and colluvium derived from sandstone. Slopes range from 25 to 40 percent.

These soils are loamy-skeletal, mixed (calcareous), frigid Xeric Torriorthents.

Typical pedon of Slinger gravelly loam, 25 to 40 percent slopes, about 650 feet south and 1,700 feet west of the northeast corner of sec. 11, T. 10 N., R. 5 E.

A1—0 to 5 inches; reddish brown (5YR 5/4) gravelly loam, yellowish red (5YR 4/6) moist; weak fine granular structure; soft, friable; 30 percent gravel; very strongly calcareous; disseminated carbonates; strongly alkaline (pH 8.6); clear wavy boundary.

C1—5 to 14 inches; yellowish red (5YR 5/6) gravelly loam, dark red (2.5YR 3/5) moist; weak fine granular structure; soft, friable; 30 percent gravel; strongly calcareous; disseminated carbonates; strongly alkaline (pH 8.8); clear wavy boundary.

C2—14 to 23 inches; red (2.5YR 5/6) very gravelly loam, red (2.5YR 4/6) moist; moderate fine subangular blocky structure; slightly hard, firm; 55 percent gravel; strongly carcareous; disseminated carbonates; strongly alkaline (pH 8.8); abrupt wavy boundary.

R—23 inches; fractured sandstone.

Fractured sandstone is at a depth of 20 to 40 inches. The ochric epipedon is 4 to 9 inches thick. The control section is 45 to 70 percent rock fragments, mainly angular gravel and some cobbles.

The A horizon has value of 5 or 6 when dry, and it has chroma of 4 to 6 when dry and 6 to 8 when moist. It is 15 to 30 percent gravel. The A horizon is strongly calcareous or very strongly calcareous.

The C horizon has hue of 2.5YR or 5YR, value of 5 or 6 when dry and 3 to 5 when moist, and chroma of 4 to 8 when dry and 6 to 8 when moist. It commonly is very gravelly loam but is gravelly loam or very cobbly loam in some pedons. It is 30 to 65 percent rock fragments, of which 20 to 50 percent is gravel and 0 to 45 percent is cobbles. The C horizon is moderately calcareous or strongly calcareous.

Solak series

The Solak series consists of shallow, somewhat excessively drained, moderately permeable soils on the sides of foothills and mountains and on ridges. These soils formed in residuum and colluvium derived from conglomerate composed of sandstone, quartzite, and limestone. Slopes range from l0 to 60 percent.

These soils are loamy-skeletal, mixed (calcareous), frigid Lithic Xeric Torriorthents.

Typical pedon of Solak gravelly loam, 10 to 50 percent slopes, about 1,200 feet east and 300 feet south of the northwest corner of sec. 32, T. 13 N., R. 6 E.

A1—0 to 5 inches; brown (7.5YR 5/3) gravelly loam, dark brown (7.5YR 3/3) moist; weak fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; 25 percent gravel; slightly calcareous; soft masses of carbonates; mildly alkaline (pH 7.6); clear smooth boundary.

C1—5 to 9 inches; light brown (7.5YR 6/4) very gravelly loam, brown (7.5YR 5/4) moist; weak fine subangular blocky structure; hard, friable, slightly sticky and slightly plastic; 50 percent gravel and 5 percent cobbles; strongly calcareous; soft masses of carbonates; moderately alkaline (pH 8.2); clear wavy boundary.

C2—9 to 15 inches; pink (7.5YR 7/4) extremely gravelly loam, light brown (7.5YR 6/4) moist; weak fine and medium subangular blocky structure; hard, friable, slightly sticky; 60 percent gravel and 5 percent cobbles; strongly calcareous; soft masses of carbonates; strongly alkaline (pH 8.8); abrupt wavy boundary.

R—15 inches; conglomerate.

Depth to bedrock typically is about 15 inches, but it ranges from 10 to 20 inches. The control section is 35 to 80 percent rock fragments, mainly gravel and some cobbles.

The A1 horizon is 2 to 6 inches thick. It has hue of 5YR, 7.5YR, or 10YR, value of 4 to 7 when dry and 3 or 4 when moist, and chroma of 3 or 4 when dry and 2 to 4 when moist. It commonly is gravelly loam but is very cobbly loam in some pedons. The A1 horizon is neutral to moderately alkaline and is noncalcareous to strongly calcareous.

The C horizon has hue of 5YR, 7.5YR, or 10YR, value of 4 to 8 when dry and 3 to 7 when moist, and chroma of 2 to 6 when dry and 3 to 8 when moist. It commonly is very gravelly or extremely gravelly loam but is extremely cobbly sandy loam or extremely cobbly loam in some pedons. The C horizon is slightly alkaline to strongly alkaline and is slightly calcareous to strongly calcareous.

St. Marys series

The St. Marys series consists of deep, well drained, moderately permeable soils on foothills, mountainsides, and ridges. These soils formed in colluvium derived from conglomerate. Slopes range from 10 to 50 percent.

These soils are loamy-skeletal, mixed, frigid Typic Haploxerolls.

Typical pedon of St. Marys loam, 10 to 40 percent slopes, about 400 feet east and 2,000 feet north of the southwest corner of sec. 1, T. 8 N., R. 4 E.

A11—0 to 2 inches; dark reddish brown (5YR 3/2) loam, reddish brown (5YR 4/4) dry; weak fine granular structure; soft, friable; 10 percent gravel; neutral (pH 6.8); abrupt smooth boundary.

A12—2 to 10 inches; dark reddish brown (5YR 3/3) loam, reddish brown (5YR 4/4) dry; weak fine granular structure; slightly hard, firm; about 10 percent gravel and cobbles; neutral (pH 6.8); abrupt wavy boundary.
B2—10 to 32 inches; dark reddish brown (2.5YR 3/4) extremely cobbly loam, red (2.5YR 4/6) dry; weak fine subangular blocky structure; hard, firm; 20 percent gravel and 50 percent cobbles; mildly alkaline (pH 7.6); clear wavy boundary.
C—32 to 45 inches; dark red (2.5YR 3/6) extremely cobbly loam, red (2.5YR 5/6) dry; massive; hard, friable; 15 percent gravel and 70 percent cobbles; mildly alkaline (pH 7.6); abrupt wavy boundary.
R—45 inches; fractured sandstone.

The mollic epipedon is 10 to 18 inches thick. Depth to bedrock ranges from 40 to 60 inches. The solum is 22 to 35 inches thick.

The A horizon has hue of 10YR, 7.5YR, or 5YR, value of 4 or 5 when dry, and chroma of 2 or 3 when moist and 3 or 4 when dry. It is loam or gravelly loam.

The B horizon has hue of 2.5YR or 5YR, value of 4 or 5 when dry, and chroma of 4 to 6 when moist or dry. It is very gravelly loam or extremely cobbly loam. The B horizon is 40 to 80 percent rock fragments, of which 20 to 40 percent is gravel and 5 to 50 percent is cobbles.

The C horizon has hue of 5YR or 2.5YR, value of 4 or 5 when dry and 3 or 4 when moist, and chroma of 4 to 6 when moist or dry. It is extremely cobbly loam or extremely gravelly fine sandy loam. It is 65 to 85 percent rock fragments, of which 15 to 40 percent is gravel and 15 to 70 percent is cobbles.

Sumine series

The Sumine series consists of moderately deep, well drained, moderately permeable soils on foothills and ridges. These soils formed in residuum and colluvium derived from quartzite. Slopes range from 25 to 50 percent.

These soils are loamy-skeletal, mixed, frigid Aridic Argixerolls.

Typical pedon of Sumine stony loam, 25 to 50 percent slopes, about 2,400 feet north and 1,400 feet east of the southwest corner of sec. 15, T. 12 N., R. 5 E.

A11—0 to 8 inches; very dark grayish brown (10YR 3/2) stony loam, brown (10YR 5/3) dry; weak fine granular structure; soft, friable, slightly sticky; 15 percent gravel, 10 percent cobbles, and 5 percent stones; neutral (pH 6.8); clear smooth boundary.
B21t—8 to 14 inches; dark brown (7.5YR 3/2) very cobbly loam, brown (7.5YR 5/4) dry; weak fine subanglar blocky structure; slightly hard, friable, slightly sticky and slightly plastic; 25 percent gravel, 20 percent cobbles, and 10 percent stones; neutral (pH 7.0); clear wavy boundary.
B22t—14 to 22 inches; brown (7.5YR 4/3) extremely cobbly loam, light brown (7.5YR 6/5) dry; moderate fine subangular blocky structure; hard, friable, slightly sticky and slightly plastic; 30 percent gravel, 25 percent cobbles, and 15 percent stones; neutral (pH 6.8); gradual wavy boundary.
C—22 to 28 inches; reddish brown (5YR 5/4) extremely cobbly sandy loam, reddish yellow (5YR 6/6) dry; weak fine and medium subangular blocky structure; hard, friable, slightly sticky; 35 percent gravel, 25 percent cobbles, and 20 percent stones; neutral (pH 6.6); abrupt irregular boundary.
R—28 inches; fractured quartzite.

The mollic epipedon is 10 to 18 inches thick. The solum is 20 to 28 inches thick. Depth to bedrock is 20 to 40 inches.

The A horizon has value of 4 or 5 when dry and 2 or 3 when moist, and it has chroma of 2 or 3 when moist or dry. It is 25 to 40 percent rock fragments, of which 20 to 25 percent is gravel, 10 to 15 percent is cobbles, and 5 percent is stones.

The Bt horizon has hue of 7.5YR or 10YR, value of 5 or 6 when dry and 3 to 6 when moist, and chroma of 2 to 5 when moist or dry. It is extremely cobbly loam to very gravelly loam. The horizon is 50 to 65 percent rock fragments, of which 30 to 45 percent is gravel, 10 to 25 percent is cobbles, and 5 to 20 percent is stones.

The C horizon has hue of 5YR, 7.5YR, or 10YR, value of 6 or 7 when dry and 5 or 6 when moist, and chroma of 4 to 6 when dry. It is 60 to 80 percent rock fragments, of which 35 to 55 percent is gravel, 15 to 25 percent is cobbles, and 10 to 20 percent is stones.

Thatcher series

The Thatcher series consists of very deep, well drained, moderately slowly permeable soils on alluvial fans, toe slopes, foothills, and plateaus. These soils formed in alluvium and colluvium derived from sandstone, limestone, quartzite, and conglomerate. Slopes range from 1 to 25 percent.

These soils are fine-silty, mixed, frigid Calcic Argixerolls.

Typical pedon of Thatcher silt loam, 1 to 5 percent slopes, about 2,200 feet west and 900 feet north of the southeast corner of sec. 20, T. 14 N., R. 7 E.

A11—0 to 7 inches; dark brown (10YR 3/3) silt loam, dark yellowish brown (10YR 4/4) dry; weak fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; neutral (pH 7.0); clear smooth boundary.
A12—7 to 13 inches; dark brown (7.5YR 3/3) silt loam, dark yellowish brown (10YR 4/4) dry; weak fine and medium subangular blocky structure; hard, friable, slightly sticky and plastic; neutral (pH 7.2); gradual wavy boundary.

B21t—13 to 23 inches; brown (7.5YR 4/4) silty clay loam, brown (7.5YR 5/4) dry; moderate medium and coarse subangular blocky structure; very hard, friable, slightly sticky and plastic; common thin clay films; neutral (pH 7.2); gradual wavy boundary.

B22t—23 to 31 inches; brown (7.5YR 4/4) silty clay loam, brown (7.5YR 5/4) dry; moderate fine and medium subangular blocky structure; very hard, firm, slightly sticky and plastic; continuous thin clay films; mildly alkaline (pH 7.4); clear wavy boundary.

B23tca—31 to 42 inches; brownish red (5YR 4/4) silty clay loam, light reddish brown (5YR 6/4) dry; moderate medium subangular blocky structure; extremely hard, friable, slightly sticky and plastic; moderately calcareous; soft masses of carbonates; strongly alkaline (pH 8.6); gradual wavy boundary.

C1ca—42 to 51 inches; yellowish red (5YR 4/6) silt loam, yellowish red (5YR 5/6) dry; weak medium and coarse subangular blocky structure; extremely hard, friable, slightly sticky and plastic; strongly calcareous; disseminated carbonates; strongly alkaline (pH 8.8); clear wavy boundary.

C2ca—51 to 60 inches; yellowish red (5YR 4/6) fine sandy loam, yellowish red (5YR 5/6) dry; massive; hard, friable; strongly calcareous; disseminated carbonates; strongly alkaline (pH 8.9).

The mollic epipedon is 10 to 19 inches thick. The solum is 20 to 42 inches thick. Depth to the calcic horizon is 16 to 38 inches.

The A horizon has hue of 5YR to 10YR, value of 4 or 5 when dry, and chroma of 2 to 4 when dry and 1 to 3 when moist. It is 0 to 5 percent gravel.

The Bt horizon has hue of 10YR to 5YR, value of 4 to 7 when dry and 3 to 5 when moist, and chroma of 2 to 6 when moist or dry. It is silt loam or silty clay loam. It is 0 to 5 percent gravel.

The C horizon has hue of 10YR to 5YR, value of 5 to 8 when dry and 3 to 7 when moist, and chroma of 2 to 8 when moist or dry. It commonly is silt loam, loam, or fine sandy loam and is 0 to 5 percent gravel. In some pedons it has layers of very gravelly loam or gravelly loam. The part of the C horizon below a depth of 40 inches is 20 to 45 percent rock fragments.

Vanni series

The Vanni series consists of very deep, well drained, moderately permeable soils on foothills. These soils formed in colluvium and residuum derived from limestone, sandstone, and shale. Slopes range from 10 to 60 percent.

These soils are fine-loamy, carbonatic, frigid Typic Calcixerolls.

Typical pedon of Vanni loam, 10 to 30 percent slopes, about 2,300 feet south and 300 feet east of the northwest corner of sec. 1, T. 12 N., R. 5 E.

A1—0 to 7 inches; brown (10YR 5/3) loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; 10 percent gravel; strongly calcareous; soft masses of carbonates; moderately alkaline (pH 8.4); clear smooth boundary.

B2—7 to 11 inches; light yellowish brown (10YR 6/4) heavy loam, yellowish brown (10YR 5/4) moist; weak fine subangular blocky structure; hard, friable, slightly sticky and slightly plastic; 3 percent gravel; strongly calcareous; soft masses of carbonates; moderately alkaline (pH 8.4); clear wavy boundary.

C1ca—11 to 18 inches; very pale brown (10YR 8/3) loam, very pale brown (10YR 7/3) moist; weak fine subangular blocky structure; hard, friable, slightly sticky and slightly plastic; 3 percent gravel; very strongly calcareous; soft masses of carbonates; moderately alkaline (pH 8.4); gradual wavy boundary.

C2ca—18 to 35 inches; white (10YR 8/2) loam, very pale brown (10YR 7/4) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; few fine roots; many fine and very fine pores; very strongly calcareous; soft masses of carbonates; strongly alkaline (pH 8.8); gradual wavy boundary.

C3ca—35 to 50 inches; very pale brown (10YR 8/3) loam, very pale brown (10YR 7/4) moist; weak medium subangular blocky structure; soft, friable, slightly sticky; 3 percent gravel; very strongly calcareous; soft masses of carbonates; strongly alkaline (pH 8.6); gradual wavy boundary.

C4—50 to 60 inches; very pale brown (10YR 8/3) loam, light yellowish brown (10YR 6/4) moist; weak medium subangular blocky structure; soft, friable, slightly sticky; 3 percent gravel; very strongly calcareous; soft masses of carbonates; moderately alkaline (pH 8.4).

The thickness of the solum and the depth to the calcic horizon typically are about 13 inches, but they range from 7 to 22 inches. The mollic epipedon is 7 to 13 inches thick and is moderately calcareous or strongly calcareous. The 10- to 40-inch control section is 40 to 60 percent calcium carbonate equivalent.

The A1 horizon has hue of 7.5Y or 10YR, value of 5 when dry and 3 when moist, and chroma of 3 to 4 when dry and 2 to 3 when moist. It commonly is loam but is very stony loam in some pedons. The A1 horizon is 0 to 50 percent, of which 0 to 15 percent is gravel, 0 to 20 percent is cobbles, and 0 to 10 percent is stones. It is mildly alkaline or moderately alkaline.

The B2 horizon has hue of 7.5YR or 10YR, value of 5 or 6 when dry and 4 to 5 when moist, and chroma of 3 to 4 when dry and 2 to 4 when moist. It commonly is loam, but in some pedons it is silt loam or gravelly loam that is 0 to 30 percent gravel. The B2 horizon is

moderately alkaline or strongly alkaline and is strongly calcareous or very strongly calcareous.

The Cca horizon has hue of 7.5YR or 10YR, value of 5 to 8 when dry and 4 to 7 when moist, and chroma of 2 to 4 when dry and 3 to 5 when moist. It is 0 to 25 percent rock fragments, of which 0 to 25 percent is gravel and 0 to 5 percent is cobbles. The Cca horizon is moderately alkaline to very strongly alkaline.

Vicking series

The Vicking series consists of very deep, well drained, moderately slowly permeable soils on alluvial fans. These soils formed in alluvium derived dominantly from limestone. Slopes range from 4 to 15 percent.

These soils are fine-loamy, mixed, frigid Calcic Argixerolls.

Typical pedon of Vicking silt loam, dry, 4 to 15 percent slopes, about 1,600 feet south and 2,000 feet west of the northeast corner of sec. 29, T. 11 N., R. 8 E.

A1—0 to 5 inches; very dark grayish brown (10YR 3/2) silt loam, dark brown (10YR 3/3) dry; weak fine and medium subangular blocky structure; slightly hard, friable, sticky and slightly plastic; 5 percent gravel; moderately calcareous; disseminated carbonates; moderately alkaline (pH 8.4); abrupt smooth boundary.

B21t—5 to 10 inches; dark brown (7.5YR 3/2) silty clay loam, brown (10YR 4/3) dry; moderate fine subangular blocky structure; hard, firm, sticky and plastic; many thin clay films; 5 percent gravel; moderately calcareous; disseminated carbonates; moderately alkaline (pH 8.2); clear wavy boundary.

B22t—10 to 24 inches; dark brown (10YR 3/3) silty clay loam, brown (10YR 5/4) dry; moderate fine and medium subangular blocky structure; very hard, firm, sticky and plastic; many thin clay films; 10 percent gravel; moderately calcareous; disseminated carbonates; moderately alkaline (pH 8.2); gradual wavy boundary.

C1ca—24 to 35 inches; very pale brown (10YR 7/3) gravelly loam, very pale brown (10YR 8/3) dry; weak coarse subangular blocky structure; hard, friable, slightly sticky and slightly plastic; 15 percent gravel; very strongly calcareous; coatings of carbonates on peds; strongly alkaline (pH 8.8); diffuse irregular boundary.

C2ca—35 to 60 inches; very pale brown (10YR 7/3) very gravelly loam, white (10YR 8/2) dry; weak coarse subangular blocky structure; hard, friable, slightly sticky and slightly plastic; 40 percent gravel; very strongly calcareous; coatings of carbonates on peds; strongly alkaline (pH 8.8).

The mollic epipedon is 15 to 20 inches thick. The combined thickness of the A and Bt horizons is 20 to 24 inches.

The A horizon has value of 3 or 4 when dry and 2 or 3 when moist, and it has chroma of 2 or 3 when moist or dry. It is 5 to 10 percent gravel.

The Bt horizon has hue of 10YR or 7.5YR, value of 4 to 6 when dry and 3 or 4 when moist, and chroma of 2 to 4 when moist or dry. It is silty clay loam or gravelly silty clay loam. The Bt horizon is 10 to 30 percent rock fragments, of which 10 to 25 percent is gravel and 0 to 5 percent is cobbles.

The C horizon has chroma of 2 or 3 when moist or dry. It is gravelly loam or very gravelly loam. The C horizon is 25 to 50 percent rock fragments, of which 25 to 45 percent is gravel and 0 to 5 percent is cobbles.

Wader series

The Wader series consists of very deep, poorly drained, moderately permeable soils on flood plains. These soils formed in alluvium derived from mixed parent material. Slopes range from 0 to 2 percent.

These soils are coarse-loamy, mixed Fluvaquentic Haploborolls.

Typical pedon of Wader loam, about 2,800 feet south and 1,500 feet east of the northwest corner of sec. 22, T. 10 N., R. 7 E.

A1—0 to 7 inches; very dark gray (10YR 3/1) loam, gray (10YR 5/1) dry; weak medium granular structure; slightly hard, friable, slightly sticky and slightly plastic; strongly calcareous; moderately alkaline (pH 8.4); abrupt smooth boundary.

C1—7 to 19 inches; dark brown (10YR 4/3) loam, pale brown (10YR 6/3) dry; few fine faint mottles; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; strongly calcareous; moderately alkaline (pH 8.2); abrupt smooth boundary.

C2—19 to 36 inches; dark brown (10YR 4/3) fine sandy loam, pale brown (10YR 6/3) dry; few fine faint mottles; massive; slightly hard, very friable, slightly sticky and slightly plastic; strongly calcareous; moderately alkaline (pH 8.1); abrupt smooth boundary.

IIC3—36 to 60 inches; dark grayish brown (10YR 4/2) sand, light brownish gray (10YR 6/2) dry; many coarse distinct strong brown (7.5YR 4/6) mottles; single grain; loose; slightly calcareous; moderately alkaline (pH 8.0).

Depth to a seasonal high water table is 18 to 36 inches.

The A horizon has hue of 10YR or 7.5YR, value of 2 or 3 when moist and 4 or 5 when dry, and chroma of 1 to 3 when moist or dry. It commonly is moderately alkaline, but it ranges to very strongly alkaline.

The C horizon has hue of 10YR, 7.5YR, or 5YR, value of 3 to 5 when moist and 5 or 6 when dry, and chroma of 1 to 4 when moist or dry. It commonly is loam or fine sandy loam but is silt loam in some pedons. Thin strata of sand and loamy coarse sand are in some pedons. The C horizon is moderately alkaline or strongly alkaline.

The IIC horizon, where present, has value of 5 or 6 when dry and chroma of 2 to 4 when moist or dry. It is coarse sand or sand and is 0 to 10 percent gravel.

Wader Variant

The Wader Variant consists of very deep, poorly drained, rapidly permeable soils on lake terraces and flood plains. These soils formed in alluvium derived mainly from sandstone, limestone, and quartzite. Slopes range from 0 to 2 percent.

These soils are sandy-skeletal, mixed Aquic Haploborolls.

Typical pedon of Wader Variant gravelly loam, about 1,000 feet west and 100 feet south of the northeast corner of sec. 30, T. 13 N., R. 6 E.

A11—0 to 8 inches; black (10YR 2/1) gravelly loam, very dark grayish brown (10YR 3/2) dry; weak fine granular structure; slightly hard, friable; 30 percent gravel; moderately calcareous; disseminated carbonates; strongly alkaline (pH 8.8); clear wavy boundary.

C1—8 to 12 inches; very dark grayish brown (10YR 3/2) very gravelly sandy loam, dark grayish brown (10YR 4/2) dry; single grain; loose; 55 percent gravel; moderately calcareous; disseminated carbonates; strongly alkaline (pH 8.7); clear wavy boundary.

C2—12 to 19 inches; grayish brown (10YR 5/2) very gravelly loamy sand, light brownish gray (10YR 6/2) dry; single grain; loose; 55 percent gravel; strongly calcareous; disseminated carbonates; strongly alkaline (pH 8.6); gradual wavy boundary.

C3—19 to 60 inches; pale brown (10YR 6/3) very gravelly loamy sand, light gray (10YR 7/2) dry; single grain; loose; 55 percent gravel; strongly calcareous; disseminated carbonates; strongly alkaline (pH 8.6).

The mollic epipedon is 12 to 18 inches thick. The control section is 50 to 60 percent gravel. A seasonal high water table fluctuates between depths of 24 and 48 inches. The profile is saturated in some places for at least a few days when the soil temperature is above 41 degrees F.

The A horizon has value of 3 or 4 when dry and chroma of 1 or 2 when moist or dry. It is 20 to 30 percent gravel.

The C horizon has value of 6 or 7 when dry and 5 or 6 when moist, and it has chroma of 2 or 3 when moist or dry. It is very gravelly loamy sand or very gravelly sandy loam.

Woodpass series

The Woodpass series consists of very deep, well drained, moderately slowly permeable soils on alluvial fans and uplands. These soils formed in alluvium derived from sandstone and limestone. Slopes range from 2 to 8 percent.

These soils are fine-loamy, mixed, frigid Xerollic Camborthids.

Typical pedon of Woodpass loam, 2 to 8 percent slopes, about 2,500 feet south and 1,700 feet east of the northwest corner of sec. 31, T. 10 N., R. 8 E.

A11—0 to 4 inches; brown (7.5YR 5/4) loam, dark yellowish brown (10YR 3/4) moist; weak medium subangular blocky structure parting to weak fine granular; soft, very friable; 5 percent gravel; moderately alkaline (pH 8.0); clear wavy boundary.

A12—4 to 11 inches; brown (7.5YR 5/4) loam, dark yellowish brown (10YR 4/4) moist; weak fine and medium subangular blocky structure parting to weak fine granular; soft, friable, slightly sticky and slightly plastic; 5 percent gravel; moderately alkaline (pH 8.1); clear wavy boundary.

B2—11 to 20 inches; light brown (7.5YR 6/4) loam, brown (10YR 5/3) moist; moderate fine and medium subangular blocky structure; hard, firm, sticky and plastic; 5 percent gravel; strongly calcareous; disseminated carbonates; strongly alkaline (pH 8.6); clear wavy boundary.

C1—20 to 38 inches; pink (7.5YR 7/4) loam, pale brown (10YR 6/3) moist; moderate fine and medium subangular blocky structure; extremely hard, firm, slightly sticky and slightly plastic; 10 percent gravel; strongly calcareous; disseminated carbonates; strongly alkaline (pH 8.5); gradual wavy boundary.

C2—38 to 52 inches; pink (7.5YR 7/4) loam, light yellowish brown (10YR 6/4) moist; weak medium subangular blocky structure; soft, friable, slightly sticky and slightly plastic; few fine roots; 10 percent gravel; strongly calcareous; disseminated carbonates; strongly alkaline (pH 8.5); gradual wavy boundary.

C3—52 to 60 inches; pinkish white (7.5YR 8/2) loam, light yellowish brown (10YR 6/4) moist; weak medium subangular blocky structure; slightly plastic; 5 percent gravel; strongly calcareous; disseminated carbonates; strongly alkaline (pH 8.8).

The thickness of the solum ranges from 10 to 20 inches.

The A horizon has hue of 10YR or 7.5YR, value of 4 or 5 when dry and 3 or 4 when moist, and chroma of 2 to 4 when moist or dry. It is mildly alkaline or moderately alkaline.

The B horizon has hue of 10YR or 7.5YR, value of 5 or 6 when dry and 4 or 5 when moist, and chroma of 3

or 4 when moist or dry. The B horizon commonly is loam or clay loam, but in some pedons it is silt loam or silty clay loam. It is moderately alkaline or strongly alkaline.

The C horizon has hue of 10YR and 7.5YR to 2.5Y, value of 7 or 8 when dry and 4 to 7 when moist, and chroma of 2 to 4 when moist or dry. It commonly is loam or clay loam, but in some pedons it is silt loam or silty clay loam. In some pedons strata of loamy coarse sand are below a depth of 40 inches. The C horizon is moderately calcareous or strongly calcareous.

Yeates Hollow series

The Yeates Hollow series consists of very deep and deep, well drained, slowly permeable soils on mountainsides, foothills, and alluvial fans. These soils formed in colluvium, alluvium, and residuum derived from quartzite, sandstone, and conglomerate. Slopes range from 6 to 40 percent.

These soils are clayey-skeletal, montmorillonitic, frigid Typic Argixerolls.

Typical pedon of a Yeates Hollow stony loam in an area of Yeates Hollow-Obray complex, 6 to 25 percent slopes, 900 feet south and 100 feet east of the northwest corner of sec. 8, T. 13 N., R. 5 E.

A11—0 to 4 inches; very dark brown (10YR 2/2) stony loam, dark brown (10YR 3/3) dry; weak fine platy structure parting to weak fine granular; soft, very friable, slightly sticky and slightly plastic; 15 percent gravel and 8 percent stones; neutral (pH 6.8); clear smooth boundary.

A12—4 to 12 inches; very dark brown (10YR 2/2) gravelly loam, dark brown (10YR 3/3) dry; weak medium and coarse subangular blocky structure parting to moderate fine granular; soft, very friable, sticky and plastic; 15 percent gravel; neutral (pH 6.8); clear wavy boundary.

B21t—12 to 20 inches; dark brown (7.5YR 3/3) very gravelly clay loam, dark brown (7.5YR 3/3) dry; strong fine and medium subangular blocky structure; extremely hard, firm, sticky and plastic; many thin clay films; 30 percent gravel, 10 percent cobbles, and 5 percent stones; neutral (pH 6.8); clear wavy boundary.

B22t—20 to 31 inches; dark brown (7.5YR 4/4) very gravelly heavy clay loam, brown (7.5YR 5/4) dry; strong fine and medium subangular blocky structure; extremely hard, very firm, sticky and very plastic; continuous thin clay films; 40 percent gravel and 15 percent cobbles; neutral (pH 6.8); gradual wavy boundary.

B23t—31 to 45 inches; yellowish red (5YR 4/6) extremely gravelly clay, strong brown (7.5YR 5/6) dry; strong fine and medium subangular blocky structure; extremely hard, very firm, very sticky and very plastic; thin clay films; 60 percent gravel and 10 percent cobbles; neutral (pH 6.9); gradual wavy boundary.

B24t—45 to 59 inches; strong brown (7.5YR 5/6) extremely gravelly clay, light brown (7.5YR 6/4) dry; strong fine and medium subangular blocky structure; extremely hard, firm, slightly sticky and plastic; common thin clay films; 65 percent gravel and 5 percent cobbles; neutral (pH 6.9).

The mollic epipedon is 10 to 20 inches thick. The combined thickness of the A and Bt horizons is 22 to 60 inches or more. Depth to bedrock is 47 to 60 inches or more.

The A horizon has hue of 10YR or 7.5YR, value of 3 to 5 when dry and 2 or 3 when moist, and chroma of 2 or 3 when moist or dry. It is stony loam or gravelly loam. The A horizon is 15 to 35 percent rock fragments, of which 10 to 30 percent is gravel, 0 to 20 percent is cobbles, and 1 to 10 percent is stones.

The Bt horizon has hue of 5YR or 7.5YR, value of 3 to 6 when dry and 3 to 5 when moist, and chroma of 3 to 6 when moist or dry. It is very gravelly clay loam or very cobbly clay loam. The Bt horizon is 35 to 65 percent rock fragments, of which 15 to 50 percent is gravel, 10 to 25 percent is cobbles, and 0 to 10 percent is stones.

The C horizon has hue of 5YR or 2.5YR, value of 5 to 7 when dry and 4 or 5 when moist, and chroma of 3 to 8 when moist or dry. It is very gravelly clay loam or extremely gravelly loam. The C horizon is 35 to 60 percent rock fragments, of which 30 to 55 percent is gravel and 0 to 10 percent is cobbles.

Yeljack series

The Yeljack series consists of very deep, well drained, moderately slowly permeable soils on mountainsides and ridges. These soils formed in residuum, colluvium, and local alluvium derived from sandstone. Slopes range from 6 to 40 percent.

These soils are fine-loamy, mixed Cryic Pachic Paleborolls.

Typical pedon of Yeljack loam, 6 to 25 percent slopes, about 1,000 feet east and 1,500 feet south of the northwest corner of sec. 34, T. 8 N., R. 5 E.

A1—0 to 14 inches; dark brown (7.5YR 3/2) loam, brown (7.5YR 4/4) dry; weak fine granular structure; soft, very friable; slightly acid (pH 6.2); gradual smooth boundary.

B1—14 to 30 inches; dark reddish brown (5YR 3/3) loam, reddish brown (5YR 5/4) dry; weak medium subangular blocky structure; soft, friable, slightly sticky and slightly plastic; slightly acid (pH 6.2); abrupt smooth boundary.
B21t—30 to 43 inches; yellowish red (5YR 4/6) clay loam, yellowish red (5YR 5/6) dry; moderate medium angular blocky structure; slightly hard, firm, sticky and plastic; few thin clay film on peds; slightly acid (pH 6.2); clear smooth boundary.
B22t—43 to 60 inches; yellowish red (5YR 4/6) clay loam, reddish yellow (5YR 6/6) dry; moderate medium subangular blocky structure; slightly hard, firm, sticky and plastic; slightly calcareous; neutral (pH 6.8).

The mollic epipedon is 20 to 35 inches thick. Depth to the B2t horizon is 25 to 35 inches. The combined thickness of the A1, B1, and Bt horizons is more than 60 inches.

The A horizon has hue of 10YR or 7.5YR, value of 4 or 5 when dry, and chroma of 2 or 3 when moist and 2 to 4 when dry. It is slightly acid or neutral.

The B1 horizon has hue of 7.5YR or 5YR, value of 5 to 7 when dry and 3 or 4 when moist, and chroma of 3 or 4 when moist or dry.

The Bt horizon has hue of 7.5YR or 5YR, value of 6 to 8 when dry and 4 or 5 when moist, and chroma of 4 to 6 when moist or dry. It is gravelly clay loam, clay loam, or sandy clay loam. The Bt horizon is 0 to 20 percent gravel.

Zagg series

The Zagg series consists of very deep, well drained, slowly permeable soils on rolling uplands. These soils formed in alluvium and residuum derived from siltstone and shale. Slopes range from 2 to 15 percent.

These soils are fine, montmorillonitic (calcareous), frigid Xerertic Torriorthents.

Typical pedon of a Zagg clay loam in an area of Zagg complex, 2 to 15 percent slopes, about 100 feet east and 1,000 feet north of the southwest corner of sec. 26, T. 8 N., R 7 E.

A1—0 to 9 inches; grayish brown (2.5YR 5/2) clay loam, dark grayish brown (2.5YR 4/2) moist; weak medium subangular blocky structure; very hard, very firm, sticky and very plastic; slightly calcareous; moderately alkaline (pH 8.4); clear smooth boundary.
C1—9 to 35 inches; light brownish gray (2.5YR 6/2) heavy clay loam, dark grayish brown (2.5YR 4/2) moist; weak medium prismatic structure parting to moderate medium subangular blocky; very hard, very firm, sticky and very plastic; common cicada casts; slightly calcareous; disseminated carbonates; moderately alkaline (pH 8.3); clear wavy boundary.
C2—35 to 60 inches; light brownish gray (2.5YR 6/2) heavy clay loam, grayish brown (2.5YR 5/2) moist; moderate medium subangular blocky structure; very hard, very firm, sticky, and very plastic; few cicada casts; slightly calcareous; disseminated carbonates and filaments of carbonates; moderately alkaline (pH 8.4).

The profile has deep cracks that are 1 centimeter wide and are open to the surface. The control section is 0 to 5 percent gravel.

The A horizon has hue of 2.5YR or 10YR, value of 5 or 6 when dry and 3 or 4 when moist, and chroma of 2 or 3 when moist or dry. It commonly is silty clay loam or clay loam but is gravelly clay loam in some pedons. The A horizon is alkaline or strongly alkaline. It is 0 to 20 percent gravel.

The C horizon has hue of 10YR, 7.5YR, or 5YR, value of 6 or 7 when dry and 4 to 6 when moist, and chroma of 1 to 4 when moist or dry. It commonly is clay loam, silty clay, or clay, but it is silty clay loam in some pedons. The C horizon is 35 to 45 percent clay. It is moderately alkaline or strongly alkaline and is slightly calcareous to strongly calcareous.

Zegro series

The Zegro series consists of moderately deep, well drained, slowly permeable soils on foothills. These soils formed in alluvium and residuum derived from shale and siltstone. Slopes range from 2 to 15 percent.

These soils are fine, mixed (calcareous), frigid Xeric Torriorthents.

Typical pedon of a Zegro silty clay loam in an area of Zegro-Zagg complex, 2 to 15 percent slopes, about 2,800 feet north and 100 feet east of the southwest corner of sec. 20, T. 7 N., R. 7 E.

A1—0 to 8 inches; light reddish brown (5YR 6/4) silty clay loam, reddish brown (5YR 4/4) moist; weak medium platy structure parting to weak medium subangular blocky; slightly hard, friable, very sticky and plastic; moderately calcareous; disseminated carbonates; moderately alkaline (pH 8.0); clear wavy boundary.
C1—8 to 20 inches; reddish yellow (5YR 6/8) heavy silty clay loam, yellowish red (5YR 4/8) moist; strong fine and medium subangular blocky structure; very hard, firm, sticky and very plastic; common cicada casts; strongly calcareous; disseminated carbonates; strongly alkaline (pH 8.6); abrupt wavy boundary.
C2—20 to 37 inches; white (2.5Y 8/2) heavy silty clay loam, light brownish gray (2.5Y 6/2) moist; strong

medium angular blocky structure; strongly calcareous; disseminated carbonates; strongly alkaline (pH 8.6); clear smooth boundary.

Cr—37 inches; weathered shale.

Depth to paralithic contact is 20 to 40 inches. The profile is 0 to 10 percent gravel.

The A horizon has hue of 5YR or 7.5YR, value of 5 or 6 when dry and 3 to 5 when moist, and chroma of 2 to 4 when moist or dry. It is moderately alkaline or strongly alkaline and is slightly calcareous or moderately calcareous.

The C horizon has hue of 7.5YR, 5YR, or 2.5YR, value of 6 to 8 when dry and 4 to 6 when moist, and chroma of 2 to 8 when moist or dry. It is silty clay loam or silty clay. The C horizon is moderately alkaline or strongly alkaline.

formation of the soils

This section discusses the factors of soil formation and how they have affected the development of soils in Rich County.

Soil is formed by the interaction of five soil-forming factors. Each of these factors modifies the effects of the others. The five factors are: (1) the physical, chemical, and minerological composition of the parent material; (2) the climate under which the soil material has accumulated and existed since accumulation; (3) the relief or topography of the land; (4) the plant or animal life living on or in the soil; and (5) the length of time these forces have acted upon the parent material. All five of these factors are important to soil formation; however, some may be more important than others depending on variations in location and conditions. The five soil-forming factors are discussed in the pages that follow.

parent material

Parent material is the weathered rock or unconsolidated material from which soils form. It determines to a great extent the chemical and minerological composition of the soils. The main sources of parent material in Rich County are (1) alluvium, (2) loess, and (3) residuum and local alluvium weathered from sedimentary, igneous, and metamorphic rock.

The soils that formed in recent alluvial deposits show little evidence of horizon differentiation. Examples of these soils are the somewhat poorly drained Canburn Variant and Saleratus Variant soils that formed in recent beach deposits along the shores of Bear Lake; the Cowco, Saleratus, and Wader soils that formed in medium textured recent alluvium on flood plains and alluvial fans; and the Wader Variant soils that formed in gravelly alluvial deposits on beaches and flood plains.

The soils that formed in slightly older alluvial deposits show distinct horizonation, evidence of a B horizon, or development of a lime accumulation in the profile, or all of these features. These soils are on alluvial fans, stream terraces, and flood plains. Examples of these soils are the poorly drained Bear Lake and Nevka soils that formed in medium textured alluvium, the moderately well drained to poorly drained Hival and Rich soils that formed in fine textured alluvium, the somewhat poorly drained Matheson soils that formed in wind-reworked alluvium, and the well drained Bockston and Bereniceton soils that formed in medium textured alluvium.

Loess deposits are on the foothills adjacent to the Bear River and on the plateau east of Bear Lake. These deposits vary in thickness and are underlain by a wide variety of geologic material. The loess is calcareous silt loam and loam. In some areas gravel is scattered on the surface, which indicates that the loess has been reworked by water. The soils that formed in this material are in the Pancheri and Lakridge series. Lakridge soils are moderately deep over a petrocalcic layer.

The soils on the uplands and foothills throughout most of the Bear River Plateau and part of the Bear Lake Basin formed dominantly in material derived from Tertiary sedimentary rock. Sandstone and conglomerate are most extensive, but there are smaller amounts of shale, siltstone, and limestone (*7*).

The soils in this survey area that formed in residuum, colluvium, and alluvium vary widely in depth to bedrock and texture. Thatcher, Duckree, and Woodpass soils formed in deposits derived from mixed sedimentary rock. Cutoff, Lariat, Kearl, and Dennot soils formed dominantly in material derived from sandstone and conglomerate. Zagg, Zegro, Ellett, and Murphy soils formed in medium textured to fine textured material derived from shale, siltstone, and sandstone. Highams Variant, Ramshorn, and Vanni soils formed in material derived from limestone.

The soils on the Wasatch and Crawford Mountains formed in material derived mainly from quartzite, limestone, sandstone, and shale. These rocks range in age from young Tertiary to old Precambrian. The influence of parent material on soil formation is still evident in many of the soils in the Wasatch and Crawford Mountains.

Mult, Fontreen, Hourglass, Rex, Lundy, and Agassiz soils are less than 20 inches deep. Mult and Hourglass soils formed in medium textured residuum and colluvium. Fontreen soils formed in gravelly alluvium and colluvium.

Sumine, Foxol, and Flygare soils formed in material derived mainly from quartzite. Sumine and Flygare soils formed in gravelly residuum and colluvium, and Foxol soils formed in stony residuum. Foxol soils are less than 20 inches deep.

Richville, Kamack, Bullnel, and Dagan soils are examples of soils that formed in material derived from sandstone, shale, and conglomerate. Bullnel and Richville soils formed in medium textured residuum and

colluvium. Dagan and Kamack soils formed in gravelly residuum and colluvium.

East of Bear Lake is an erosional remnant of a flow of igneous rock. The Searla soils formed in colluvium and alluvium derived from this material. These soils have a well developed B horizon and a layer of calcium carbonate accumulation. Searla soils are very gravelly throughout.

climate

The features of climate that significantly influence soil development are rainfall, temperature, humidity, and wind velocity. The amount of precipitation and variations in temperature influence the organic matter content of the soil, the kind and amount of native vegetation, the physical movement of substances in suspension or solution, and the rate of chemical processes.

In general, as rainfall increases, the soil reaction decreases, the depth to carbonate increases, and the translocation of clay and minerals increases. The flow of surface water caused by heavy rains or snowmelt continuously detatch, mix, and redeposit parent material. Soils that formed in recent alluvial deposits on flood plains are examples of soils that formed in sediment deposited by water.

Soil temperature influences the rate of chemical processes, the physical condition of the soil, and the activities of micro-organisms. Alternate freezing and thawing speed the mechanical weathering process by breaking down particles to smaller particles. The rate of chemical and biological activity increases as the temperature increases.

Climate also influences the kind and amount of vegetation produced, which has a direct effect on the amount of organic matter present in the soils. Generally, as the precipitation increases the organic matter content of the soil increases. Thus, soils on the lower foothills have a thin, light-colored surface layer, whereas soils in a higher precipitation zone have a dark-colored surface layer.

Wind also transfers soil material from one place to another. The deposits of loess in the county are examples of the importance of wind in soil deposition.

relief

Relief, or lay of the land, influences soil formation through its effect on drainage, erosion, and microclimate. The steepness of slope, shape of the surface, aspect, and other features of relief affect the development of soils.

Soils developing on level to gently sloping valley floors and flood plains have very little relief. In places, these soils are ponded or have a high water table. The saturated condition of these soils changes some physical and chemical properties by limiting the oxygen supply, reducing soil temperature, and facilitating the lateral movement of solutes and suspended material in the ground water. The presence of a high water table may result in an accumulation of soluble salts in the soils. This condition is characteristic of the Rich soils and the Bear Lake and Nevka soils that are affected by salt and alkali. Wetness also causes plants to produce abundantly. This results in a high organic matter content, which is characteristic of the Canburn, Bear Lake, and Wader soils.

The foothills and mountains consist of strongly sloping to very steep areas intermingled with small valleys and ridges. The aspect and steepness of slope are important in soil formation. The effect of aspect is reflected in the differences in the vegetation on north- and south-facing side slopes. In general, the soils on north-facing side slopes support more vegetation, have lower soil temperatures, and are higher in organic matter content than those on south-facing side slopes. Despain, Hades, and Ercan soils have a dark-colored surface layer and are dominantly on north-facing side slopes. Bequinn and Duckree soils have a thin, light-colored surface layer and are dominantly on south-facing side slopes.

The steepness of slope influences soil formation through the effects of runoff, erosion, and soil creep. Soils on steeper side slopes generally have a thinner surface layer and exhibit less development in the subsoil than do soils on nearly level side slopes. On very steep mountainsides the rate of soil erosion may equal or exceed that of soil formation. This is particularly evident on south- and west-facing slopes.

plant and animal life

Plants and animals are important in developing the chemical and physical characteristics of soils. Plants strongly influence the kind and amount of organic matter, improve soil porosity and structure, and change the chemical composition and fertility of soils. Micro-organisms, insects, and burrowing animals mix the soil material, increase soil fertility, and change vegetation from one form to another.

The lush vegetation on the wet flood plains and valley bottoms provides the organic matter present in the Bear Lake, Canburn, Rich, and Wader soils. These soils have a thick, dark-colored surface layer.

On the foothills and mountains, the density and composition of plants vary with increasing precipitation. In the lower sagebrush and grass zone, Pancheri and Duckree soils have a thin, light-colored A horizon and a weakly developed B horizon. This contrasts sharply with Ercan and Lucky Star soils in the high mountain aspen zone. These soils are characterized by a thick, dark-colored A horizon, a leached A2 horizon, and a well developed B horizon.

The vegetation can also change the chemical characteristics of the soils. In the conifer tree zone, the vegetation contributes small amounts of organic matter

to the soil; however, the organic acids formed by the decay of the litter are effective in hastening leaching. Most of the soils under the coniferous forests are medium acid or slightly acid and are low in content of bases. Condie and Scout are examples of soils in this zone that have a thin A1 horizon and a well developed A2 horizon.

time

Time is necessary for the factors of soil formation to act on parent material. The distinctness of horizons in the soil profile depends in part upon time. The soils in Rich County range from young soils that exhibit little if any horizonation to older soils that have well developed profiles.

The youngest soils in the county are on flood plains, lake shores, alluvial fans, and steep, actively eroding side slopes. The Cowco, Slinger, Gridge, and Bereniceton soils exhibit little or no horizon development. The Nevka, Duckree, and Bockston soils formed in slightly older deposits. These soils have a horizon of calcium carbonate accumulation.

The oldest and most developed soils in the county are on mountainsides. Baird Hollow, Flygare, Ercan, and Lucky Star are some of the older soils in the area. These soils have a thick, dark-colored surface layer, a leached A2 horizon, and a well developed subsoil. They do not have a horizon of calcium carbonate accumulation.

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glossary

ABC soil. A soil having an A, a B, and a C horizon.

AC soil. A soil having only an A and a C horizon. Commonly such soil formed in recent alluvium or on steep rocky slopes.

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alkali (sodic) soil. A soil having so high a degree of alkalinity (pH 8.5 or higher), or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Animal-unit-month. The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Association, soil. A group of soils geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as—

	Inches
Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	More than 12

Base saturation. The degree to which material having cation exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the total cation exchange capacity.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bisequum. Two sequences of soil horizons, each of which consists of an illuvial horizon and the overlying eluvial horizons.

Bottom land. The normal flood plain of a stream, subject to flooding.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Catena. A sequence, or "chain," of soils on a landscape that formed in similar kinds of parent material but have different characteristics as a result of differences in relief and drainage.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity, but is more precise in meaning.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Climax vegetation. The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles (flagstone) 15.2 to 38.1 centimeters (6 to 15 inches) long.

Coarse textured soil. Sand or loamy sand.

Cobblestone (or cobble). A rounded or partly rounded fragment of rock 3 to 10 inches (7.5 to 25 centimeters) in diameter.

Colluvium. Soil material, rock fragments, or both moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex slope. Irregular or variable slope. Planning or constructing terraces, diversions, and other water-control measures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils are somewhat similar in all areas.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—
Loose.—Noncoherent when dry or moist; does not hold together in a mass.
Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.
Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.
Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.
Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.
Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.
Soft.—When dry, breaks into powder or individual grains under very slight pressure.
Cemented.—Hard; little affected by moistening.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Deferred grazing. Postponing grazing or arresting grazing for a prescribed period.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:
Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.
Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.
Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.
Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.
Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

Drainage, surface. Runoff, or surface flow of water, from an area.

Effective precipitation. The annual precipitation received plus any moisture received as a result of the melting of accumulated snow that has blown in from adjacent areas.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes the surface.

Excess alkali (in tables). Excess exchangeable sodium in the soil. The resulting poor physical properties restrict the growth of plants.

Excess fines (in tables). Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.

Excess lime (in tables). Excess carbonates in the soil that restrict the growth of some plants.

Excess salts (in tables). Excess water-soluble salts in the soil that restrict the growth of most plants.

Fallow. Cropland left idle in order to restore productivity through accumulation of moisture. Summer fallow is common in regions of limited rainfall where cereal grains are grown. The soil is tilled for at least one growing season for weed control and decomposition of plant residue.

Fast intake (in tables). The rapid movement of water into the soil.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

Fine textured soil. Sandy clay, silty clay, and clay.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Foot slope. The inclined surface at the base of a hill.

Forb. Any herbaceous plant not a grass or a sedge.

Fragile (in tables). A soil that is easily damaged by use or disturbance.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Gilgai. Commonly a succession of microbasins and microknolls in nearly level areas or of microvalleys and microridges parallel with the slope. Typically, the microrelief of Vertisols—clayey soils having a high coefficient of expansion and contraction with changes in moisture content.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors and mottles.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.5 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.5 centimeters) in diameter.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Hardpan. A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an upper case letter represents the major horizons. Numbers or lower case letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the *Soil Survey Manual*. The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue at the surface of a mineral soil.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil does not have a B horizon, the A horizon alone is the solum.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the A or B horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, the Roman numeral II precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

Hummocky. Refers to a landscape of hillocks, separated by low sags, having sharply rounded tops and steep sides. Hummocky relief resembles rolling or undulating relief, but the tops of ridges are narrower and the sides are shorter and less even.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake in inches per hour is expressed as follows:

Less than 0.2	very low
0.2 to 0.4	low
0.4 to 0.75	moderately low
0.75 to 1.25	moderate
1.25 to 1.75	moderately high
1.75 to 2.5	high
More than 2.5	very high

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are—

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.
Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.
Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.
Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Landslide. The rapid downhill movement of a mass of soil and loose rock, generally when wet or saturated. The speed and distance of movement, as well as the amount of soil and rock material, vary greatly.

Large stones (in tables). Rock fragments 3 inches (7.5 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind.

Low strength. The soil is not strong enough to support loads.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Metamorphic rock. Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement. Nearly all such rocks are crystalline.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Sandy loam and fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, and silty clay loam.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Munsell notation. A designation of color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.20 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management. For example, slope, stoniness, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Pitting (in tables). Pits caused by melting ground ice. They form on the soil after plant cover is removed.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Ponding. Standing water on soils in closed depressions. The water can be removed only by percolation or evapotranspiration.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Rangeland. Land on which the potential natural vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. It includes natural grasslands, savannas, many wetlands, some deserts, tundras, and areas that support certain forb and shrub communities.

Range condition. The present composition of the plant community on a range site in relation to the potential natural plant community for that site. Range condition is expressed as excellent, good, fair, or poor, on the basis of how much the present plant community has departed from the potential.

Range site. An area of rangeland where climate, soil, and relief are sufficiently uniform to produce a distinct natural plant community. A range site is the product of all the environmental factors responsible for its development. It is typified by an association of species that differ from those on other range sites in kind or proportion of species or total production.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	pH
Extremely acid	Below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Regolith. The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock.

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered, or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rill. A steep sided channel resulting from accelerated erosion. A rill is generally a few inches deep and not wide enough to be an obstacle to farm machinery.

Rippable. Bedrock or hardpan can be excavated using a single-tooth ripping attachment mounted on a tractor with a 200-300 draw bar horsepower rating.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Saline soil. A soil containing soluble salts in an amount that impairs growth of plants. A saline soil does not contain excess exchangeable sodium.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-size particles.

Salty water (in tables.) Water that is too salty for consumption by livestock.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Sequum. A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and runoff water.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silica. A combination of silicon and oxygen. The mineral form is called quartz.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Sinkhole. A depression in the landscape where limestone has been dissolved.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75 feet.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

Slick spot. A small area of soil having a puddled, crusted, or smooth surface and an excess of exchangeable sodium. The soil is generally silty or clayey, is slippery when wet, and is low in productivity.

Slippage (in tables). Soil mass susceptible to movement downslope when loaded, excavated, or wet.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slope (in tables). Slope is great enough that special practices are required to insure satisfactory performance of the soil for a specific use.

Slow intake (in tables). The slow movement of water into the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.5 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Sodicity. The degree to which a soil is affected by exchangeable sodium. Sodicity is expressed as a sodium absorption ratio (SAR) of a saturation extract, or the ratio of Na^+ to $Ca^{++} + Mg^{++}$. The degrees of sodicity are—

	SAR
Slight	Less than 13:1
Moderate	13-30:1
Strong	More than 30:1

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 mm in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows:

	Millimeters
Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Stone line. A concentration of coarse fragments in a soil. Generally it is indicative of an old weathered surface. In a cross section, the line may be one fragment or more thick. It generally overlies material that weathered in place and is overlain by recent sediment of variable thickness.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stripcropping. Growing crops in a systematic arrangement of strips or bands which provide vegetative barriers to wind and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Tilling a soil below normal plow depth, ordinarily to shatter a hardpan or claypan.

Substratum. The part of the soil below the solum.

Subsurface layer. Technically, the A2 horizon. Generally refers to a leached horizon lighter in color and lower in content of organic matter than the overlying surface layer.

Summer fallow. The tillage of uncropped land during the summer to control weeds and allow storage of moisture in the soil for the growth of a later crop. A practice common in semiarid regions, where annual precipitation is not enough to produce a crop every year. Summer fallow is frequently practiced before planting winter grain.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field is generally built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material too thin for the specified use.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toe slope. The outermost inclined surface at the base of a hill; part of a foot slope.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Trace elements. Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, are in soils in extremely small amounts. They are essential to plant growth.

Tuff. A compacted deposit that is 50 percent or more volcanic ash and dust.

Unstable fill (in tables). Risk of caving or sloughing on banks of fill material.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Valley fill. In glaciated regions, material deposited in stream valleys by glacial melt water. In nonglaciated regions, alluvium deposited by heavily loaded streams.

Variant, soil. A soil having properties sufficiently different from those of other known soils to justify a new series name, but occurring in such a limited geographic area that creation of a new series is not justified.

Water supplying capacity. The capacity of a soil to supply water that is stored during periods of plant dormancy plus precipitation during the growing season until the moisture is depleted.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

[Recorded in the period 1910-75 at Laketown, Utah; elevation 5,980 feet]

Month	Temperature			Precipitation			
	Mean daily maximum	Mean daily minimum	Mean monthly	Rainfall		Snowfall	
				Mean	Daily maximum	Mean	Monthly maximum
	°F	°F	°F	In	In	In	In
January----	31.7	10.1	20.9	0.92	0.79	10.4	26.5
February---	34.2	10.4	22.3	0.81	1.05	9.7	38.5
March------	40.9	17.4	29.2	0.92	0.85	7.6	37.5
April------	53.5	27.7	40.4	1.18	1.10	4.7	20.0
May--------	65.4	34.8	50.1	1.10	1.18	1.0	18.4
June-------	75.2	40.7	58.2	1.02	1.32	0.1	2.0
July-------	83.6	47.0	65.4	0.59	0.74	0.0	*
August-----	81.5	45.2	63.4	0.73	0.89	0.0	*
September--	71.9	37.3	54.6	0.99	1.45	0.2	4.0
October----	59.4	29.5	44.5	1.21	1.29	2.4	24.0
November---	44.1	21.3	32.7	0.91	1.15	5.0	23.2
December---	34.8	14.8	24.7	0.86	1.37	8.7	30.0
Annual---	56.3	28.0	42.2	11.24	1.45	49.8	38.5

[Recorded in the period 1897-1975 at Woodruff, Utah; elevation 6,343 feet]

January----	28.5	1.2	14.8	0.56	1.20	7.7	29.0
February---	32.3	4.9	18.3	0.62	0.80	8.0	32.5
March------	40.1	14.6	27.3	0.72	1.20	7.2	36.1
April------	52.9	24.6	38.7	0.85	1.43	4.6	17.8
May--------	63.6	30.9	47.3	1.00	2.20	1.9	13.5
June-------	71.9	37.8	54.9	0.98	1.79	0.0	0.0
July-------	81.2	42.4	61.8	0.78	1.44	0.0	0.0
August-----	79.8	40.3	60.0	0.90	1.42	0.0	0.0
September--	71.5	31.4	51.4	0.84	1.80	0.4	9.5
October----	59.5	23.2	41.4	1.02	2.00	2.3	12.0
November---	43.3	13.6	27.8	0.57	1.11	4.6	20.2
December---	31.9	5.4	18.8	0.53	1.50	6.1	21.0
Annual---	54.7	22.5	38.5	9.37	2.20	42.8	36.1

Trace

TABLE 2.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
AAD	Agassiz-Mult complex, 10 to 25 percent slopes	2,030	0.3
AAF	Agassiz-Mult complex, 25 to 60 percent slopes	1,230	0.2
ABF	Agassiz-Richville complex, 10 to 60 percent slopes	1,250	0.2
ACF	Agassiz-Rock outcrop complex, 25 to 60 percent slopes	8,030	1.2
ADD	Alhark loam, 6 to 15 percent slopes	8,660	1.3
ADE	Alhark loam, 15 to 30 percent slopes	4,530	0.7
AEC	Alhark silt loam, loamy substratum, 4 to 10 percent slopes	2,840	0.4
AFD	Ant Flat silt loam, dry, 10 to 25 percent slopes	2,320	0.4
BAD	Baird Hollow silt loam, 10 to 25 percent slopes	6,680	1.0
BB	Bear Lake silt loam	15,350	2.3
BC	Bear Lake silt loam, ponded	1,240	0.2
BD	Bear Lake silty clay loam, saline-alkali	960	0.1
BEF	Bequinn very gravelly loam, 30 to 50 percent slopes	6,000	0.9
BFB	Bereniceton silt loam, cool, 1 to 3 percent slopes	3,850	0.6
BGE	Bereniceton gravelly loam, cool, 15 to 25 percent slopes	2,290	0.3
BHA	Bockston loam, cool, 0 to 3 percent slopes	4,850	0.7
BHB	Bockston loam, cool, 3 to 6 percent slopes	1,230	0.2
BJC	Bullnel loam, 4 to 15 percent slopes	6,620	1.0
BJE	Bullnel loam, 15 to 30 percent slopes	11,000	1.7
CA	Canburn silt loam	1,130	0.2
CBD	Cloud Rim, dry-McCarey loams, 4 to 15 percent slopes	1,730	0.3
CCE	Cluff gravelly loam, 10 to 40 percent slopes	510	0.1
CDD	Condie gravelly loam, 6 to 25 percent slopes	2,030	0.3
CDE	Condie gravelly loam, 25 to 40 percent slopes	3,100	0.5
CEA	Cowco loam, 0 to 3 percent slopes	12,950	2.0
CEB	Cowco loam, 3 to 6 percent slopes	3,240	0.5
CFA	Cowco silty clay loam, saline-alkali, 0 to 3 percent slopes	2,270	0.3
CGD	Cutoff gravelly loam, 6 to 25 percent slopes	9,230	1.4
CGF	Cutoff gravelly loam, 25 to 60 percent slopes	13,260	2.0
CHF	Cutoff-Falula complex, 4 to 60 percent slopes	3,780	0.6
DAF	Dagan gravelly loam, moist, 25 to 40 percent slopes	12,300	1.9
DBF	Dagan very stony loam, 40 to 70 percent slopes	1,420	0.2
DCF	Dagan gravelly silt loam, 25 to 40 percent slopes	8,720	1.3
DDF	Dagan-Rubble Land complex, 40 to 70 percent slopes	3,280	0.5
DEE	Dennot loam, 25 to 40 percent slopes	9,360	1.4
DFC	Dennot very gravelly loam, 4 to 15 percent slopes	5,050	0.8
DGF	Despain gravelly loam, 30 to 60 percent slopes	3,500	0.5
DHB	Despain Variant gravelly loam, 1 to 3 percent slopes	460	0.1
DJA	Duckree loam, 0 to 3 percent slopes	650	0.1
DKD	Duckree gravelly loam, 3 to 25 percent slopes	6,250	1.0
DLE	Duckree gravelly silt loam, 15 to 40 percent slopes	17,450	2.7
DMF	Duckree-St. Marys, dry association, 25 to 50 percent slopes	5,110	0.8
EAC	Ellett silt loam, 2 to 10 percent slopes	800	0.1
EAE	Ellett silt loam, 10 to 30 percent slopes	5,430	0.8
EBD	Ercan loam, 3 to 15 percent slopes	1,500	0.2
EBE	Ercan loam, 15 to 30 percent slopes	2,480	0.4
ECE	Etchen very cobbly loam, 25 to 40 percent slopes	3,230	0.5
FAE	Falula very gravelly loam, 4 to 25 percent slopes	9,570	1.5
FBC	Falula gravelly silt loam, 1 to 10 percent slopes	490	0.1
FCE	Falula-Kearl complex, 4 to 25 percent slopes	11,700	1.8
FDF	Flygare gravelly loam, 25 to 50 percent slopes	700	0.1
FEE	Fontreen-Rexmont, very shallow complex, 6 to 40 percent slopes	6,750	1.0
FFF	Foxol extremely stony sandy loam, 30 to 60 percent slopes	4,800	0.7
FGE	Foxol very stony loam, 10 to 40 percent slopes	1,340	0.2
GAD	Gobine silt loam, 1 to 10 percent slopes	5,710	0.9
GBE	Gridge-Rock outcrop complex, 25 to 40 percent slopes	5,250	0.8
GCE	Guilder loam, 15 to 25 percent slopes	750	0.1
HAB	Hades silt loam, 3 to 6 percent slopes	2,400	0.4
HBD	Hawkins silty clay loam, 6 to 25 percent slopes	490	0.1
HC	Hival silty clay loam	3,710	0.6
HDC	Horrocks gravelly loam, 6 to 10 percent slopes	900	0.1
HEF	Hourglass silt loam, 25 to 50 percent slopes	1,780	0.3
JAE	Jebo very gravelly loam, 15 to 25 percent slopes	5,020	0.8
JAF	Jebo very gravelly loam, 25 to 40 percent slopes	8,840	1.4
KAF	Kamack loam, 30 to 60 percent slopes	950	0.1
KBD	Kearl loam, 4 to 15 percent slopes	18,100	2.8
KBE	Kearl loam, 15 to 25 percent slopes	8,330	1.3
KBF	Kearl loam, 25 to 40 percent slopes	1,670	0.3
KCD	Kearl-Richville, dry complex, 4 to 15 percent slopes	19,720	3.0
LAD	Lakridge silt loam, 5 to 10 percent slopes	2,220	0.3

TABLE 2.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--Continued

Map symbol	Soil name	Acres	Percent
LBC	Lariat fine sandy loam, 4 to 10 percent slopes	12,770	2.0
LCD	Lonjon silt loam, 2 to 10 percent slopes	2,510	0.4
LCE	Lonjon silt loam, 10 to 30 percent slopes	1,440	0.2
LDD	Lucky Star gravelly loam, 8 to 25 percent slopes	5,500	0.8
LDF	Lucky Star gravelly loam, 25 to 60 percent slopes	10,500	1.6
LEF	Lucky Star-Condie gravelly loams, 25 to 60 percent slopes	1,500	0.2
LFF	Lundy, dry-Rock outcrop complex, 25 to 60 percent slopes	6,100	0.9
MAA	Matheson sandy loam, wet, 0 to 2 percent slopes	920	0.1
MBE	Mirror Lake-Sambrito sandy loams, 10 to 30 percent slopes	800	0.1
MCD	Mult-Agassiz complex, 10 to 25 percent slopes	2,340	0.4
MDC	Murphy-Richville, dry complex, 4 to 8 percent slopes	10,170	1.6
MDE	Murphy-Richville, dry complex, 15 to 30 percent slopes	8,300	1.3
NAD	Neponset sandy loam, 6 to 10 percent slopes	4,490	0.7
NBA	Nevka loam	1,840	0.3
NCA	Nevka loam, wet	5,080	0.8
PAC	Pancheri silt loam, cool, 1 to 5 percent slopes	12,480	1.9
PAD	Pancheri silt loam, cool, 5 to 10 percent slopes	16,910	2.6
PAE	Pancheri silt loam, cool, 10 to 25 percent slopes	6,680	1.0
PAE2	Pancheri silt loam, cool, 10 to 20 percent slopes, eroded	4,280	0.7
PBF	Pancheri-Highams Variant-Rock outcrop complex, 6 to 50 percent slopes	1,800	0.3
PD	Pits-Dumps complex	470	0.1
RAD	Ramshorn gravelly loam, 8 to 15 percent slopes	1,250	0.2
RBD	Ramshorn Variant-Highams complex, 2 to 15 percent slopes	1,980	0.3
RBE	Ramshorn Variant-Highams complex, 15 to 40 percent slopes	2,080	0.3
RCG	Rexmont-Rock outcrop complex, 25 to 70 percent slopes	3,020	0.5
RD	Rich loam, wet	1,100	0.2
RE	Rich silt loam	3,630	0.6
RFD	Richens loam, 10 to 30 percent slopes	1,230	0.2
RGF	Richens-Agassiz complex, 25 to 60 percent slopes	550	0.1
RHC	Richville loam, dry, 4 to 8 percent slopes	1,690	0.3
RHD	Richville loam, dry, 8 to 15 percent slopes	2,510	0.4
SA	Saleratus loam	8,130	1.2
SB	Saleratus loam, saline-alkali	2,310	0.4
SC	Saleratus Variant-Canburn Variant complex	460	0.1
SDF	Sambrito sandy loam, 25 to 60 percent slopes	2,490	0.4
SEE	Scout very stony loam, 10 to 40 percent slopes	2,270	0.3
SFD	Searla very gravelly silt loam, 8 to 25 percent slopes	750	0.1
SGF	Slinger gravelly loam, 25 to 40 percent slopes	9,000	1.4
SHF	Solak gravelly loam, 10 to 50 percent slopes	18,300	2.8
SJF	Solak gravelly loam, dry, 25 to 60 percent slopes	3,190	0.5
SKF	Solak-Ranruff-Rock outcrop complex, 30 to 60 percent slopes	10,660	1.6
SLE	St. Marys loam, 10 to 40 percent slopes	1,050	0.2
SME	St. Marys-Yeljack, north loams, 10 to 40 percent slopes	2,670	0.4
SNF	Sumine stony loam, 25 to 50 percent slopes	4,930	0.8
TAB	Thatcher silt loam, 1 to 5 percent slopes	7,730	1.2
TAD	Thatcher silt loam, 5 to 10 percent slopes	2,640	0.4
TAE	Thatcher silt loam, 10 to 20 percent slopes	1,860	0.3
TBA	Thatcher silt loam, warm, 1 to 3 percent slopes	2,090	0.3
TBB	Thatcher silt loam, warm, 3 to 6 percent slopes	560	0.1
TBC	Thatcher silt loam, warm, 6 to 10 percent slopes	1,980	0.3
TBD	Thatcher silt loam, warm, 10 to 25 percent slopes	1,700	0.3
VAE	Vanni loam, 10 to 30 percent slopes	13,560	2.1
VAF	Vanni loam, 30 to 50 percent slopes	1,870	0.3
VBF	Vanni very stony loam, 40 to 60 percent slopes	890	0.1
VCD	Vicking silt loam, dry, 4 to 15 percent slopes	1,030	0.2
WA	Wader loam	8,100	1.2
WB	Wader loam, saline-alkali	620	0.1
WC	Wader Variant gravelly loam	1,540	0.2
WDC	Woodpass loam, 2 to 8 percent slopes	16,570	2.5
YAE	Yeates Hollow gravelly loam, 25 to 40 percent slopes	760	0.1
YBD	Yeates Hollow-Obray complex, 6 to 25 percent slopes	8,000	1.2
YCD	Yeljack loam, 6 to 25 percent slopes	2,380	0.4
YDE	Yeljack loam, north, 10 to 30 percent slopes	6,250	1.0
YEE	Yeljack-Cluff complex, 10 to 40 percent slopes	1,480	0.2
ZAD	Zagg complex, 2 to 15 percent slopes	10,610	1.6
ZBC	Zegro silty clay loam, 2 to 5 percent slopes	3,070	0.5
ZCD	Zegro-Zagg complex, 2 to 15 percent slopes	4,930	0.8
	Water	35,145	5.4
	Total	654,720	100.0

TABLE 3.--CAPABILITY CLASSES AND SUBCLASSES

[All soils are assigned to nonirrigated capability subclasses (N). Only those potentially irrigable soils are assigned to irrigated subclasses (I). Miscellaneous areas are excluded. Dashes mean no acreage]

Class	Total acreage	Major management concerns (Subclass)			
		Erosion (e)	Wetness (w)	Soil problem (s)	Climate (c)
		Acres	Acres	Acres	Acres
I (N)	---	---	---	---	---
(I)	---	---	---	---	---
II (N)	---	---	---	---	---
(I)	---	---	---	---	---
III (N)	---	---	---	---	---
(I)	5,510	2,960	---	460	2,090
IV (N)	26,640	20,840	3,710	---	2,090
(I)	91,039	36,549	25,370	7,470	21,650
V (N)	3,630	---	3,630	750	---
VI (N)	417,944	346,682	460	48,402	21,650
VII (N)	220,803	90,929	8,400	121,474	---
VIII (N)	---	---	---	---	---

TABLE 4.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES

[Only the soils that support rangeland vegetation suitable for grazing are listed]

Soil name and map symbol	Range site name	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
ABF*:					
Agassiz	Mountain Shallow Loam (Curlleaf Mountainmahogany)	Favorable	2,500	Curlleaf mountainmahogany	40
		Normal	1,800	Bluebunch wheatgrass	25
		Unfavorable	1,300	Antelope bitterbrush	5
Richville	Mountain Gravelly Loam	Favorable	2,400	Bluebunch wheatgrass	30
		Normal	1,500	Birchleaf mountainmahogany	15
		Unfavorable	1,200	Nevada bluegrass	12
				Muttongrass	10
				Longtongue muttongrass	5
ACF*:					
Agassiz	Mountain Shallow Loam (Curlleaf Mountainmahogany)	Favorable	2,500	Curlleaf mountainmahogany	40
		Normal	1,800	Bluebunch wheatgrass	25
		Unfavorable	1,300	Antelope bitterbrush	5
Rock outcrop.					
ADD, ADE Alhark	Semidesert Loam	Favorable	1,100	Bluebunch wheatgrass	22
		Normal	735	Needleandthread	15
		Unfavorable	400	Big sagebrush	15
				Bottlebrush squirreltail	10
				Sandberg bluegrass	5
				Arrowleaf balsamroot	5
				Winterfat	5
AEC Alhark	Upland Loam	Favorable	2,250	Bluebunch wheatgrass	28
		Normal	1,475	Indian ricegrass	10
		Unfavorable	700	Nevada bluegrass	10
				Lanceleaf yellowbrush	7
				Antelope bitterbrush	6
				Big sagebrush	5
AFD Ant Flat	Upland Loam	Favorable	2,250	Bluebunch wheatgrass	28
		Normal	2,350	Nevada bluegrass	10
		Unfavorable	700	Big sagebrush	10
				Lanceleaf yellowbrush	10
				Antelope bitterbrush	6
				Basin wildrye	5
				Muttongrass	5
				Arrowleaf balsamroot	5
BEF Bequinn	Semidesert Stony Loam	Favorable	1,050	Bluebunch wheatgrass	30
		Normal	600	Indian ricegrass	15
		Unfavorable	475	Shadscale	10
				Sandberg bluegrass	8
				Needleandthread	5
				Bottlebrush squirreltail	5
				Tapertip hawksbeard	5
				Arrowleaf balsamroot	5
				Black sagebrush	5
				Big sagebrush	5
BFB, BGE Bereniceton	Semidesert Loam	Favorable	1,100	Bluebunch wheatgrass	22
		Normal	735	Needleandthread	15
		Unfavorable	400	Big sagebrush	15
				Bottlebrush squirreltail	10
				Sandberg bluegrass	5
				Arrowleaf balsamroot	5
				Winterfat	5

See footnote at end of table.

TABLE 4.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site name	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
BHA, BHB---------- Bockston	Semidesert Loam----------	Favorable Normal Unfavorable	1,100 735 400	Bluebunch wheatgrass---------- Needleandthread---------- Big sagebrush---------- Bottlebrush squirreltail------ Sandberg bluegrass---------- Arrowleaf balsamroot---------- Winterfat----------	22 15 15 10 5 5 5
BJC---------- Bullnel	Mountain Gravelly Loam--------	Favorable Normal Unfavorable	2,500 1,500 700	Bluebunch wheatgrass---------- Nevada bluegrass---------- Muttongrass---------- Bulbous oniongrass---------- Antelope bitterbrush---------- Idaho fescue---------- Prairie junegrass---------- Big sagebrush----------	25 10 8 8 8 5 5 5
BJE---------- Bullnel	Mountain Gravelly Loam--------	Favorable Normal Unfavorable	2,400 1,500 1,200	Bluebunch wheatgrass---------- Birchleaf mountainmahogany---- Muttongrass---------- Nevada bluegrass----------	30 17 15 12
CBD*: Cloud Rim----------	Upland Loam----------	Favorable Normal Unfavorable	2,000 1,325 800	Bluebunch wheatgrass---------- Birchleaf mountainmahogany---- Nevada bluegrass---------- Muttongrass----------	30 17 12 10
McCarey----------	Upland Stony Loam----------	Favorable Normal Unfavorable	1,775 975 600	Bluebunch wheatgrass---------- Mutton bluegrass---------- Nevada bluegrass---------- Needleandthread---------- Black sagebrush---------- Sandberg bluegrass---------- Big sagebrush---------- Antelope bitterbrush----------	40 7 7 7 7 5 5 5
CEA, CEB---------- Cowco	Semidesert Loam----------	Favorable Normal Unfavorable	1,100 735 400	Bluebunch wheatgrass---------- Needleandthread---------- Big sagebrush---------- Bottlebrush squirreltail------ Sandberg bluegrass---------- Arrowleaf balsamroot---------- Winterfat----------	22 15 15 10 5 5 5
CFA---------- Cowco	Alkali Bottoms----------	Favorable Normal Unfavorable	2,500 1,750 1,000	Saltgrass---------- Alkali sacaton---------- Alkali bluegrass---------- Basin wildrye---------- Sedge---------- Alkali cordgrass---------- Black greasewood---------- Rubber rabbitbrush----------	25 20 15 10 5 5 5 5
CGD, CGF---------- Cutoff	Upland Stony Loam----------	Favorable Normal Unfavorable	1,775 975 600	Bluebunch wheatgrass---------- Muttongrass---------- Nevada bluegrass---------- Needleandthread---------- Black sagebrush---------- Sandberg bluegrass---------- Big sagebrush---------- Antelope bitterbrush----------	40 7 7 7 7 5 5 5

See footnote at end of table.

TABLE 4.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site name	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
CHF*:					
Cutoff	Upland Stony Loam	Favorable	1,775	Bluebunch wheatgrass	40
		Normal	975	Muttongrass	7
		Unfavorable	600	Nevada bluegrass	7
				Needleandthread	7
				Black sagebrush	7
				Sandberg bluegrass	5
				Big sagebrush	5
				Antelope bitterbrush	5
Falula	Upland Shallow Loam	Favorable	2,000	Bluebunch wheatgrass	46
		Normal	1,500	Big sagebrush	8
		Unfavorable	700	Low sagebrush	8
				Sandberg bluegrass	5
DAF	Mountain Stony Loam	Favorable	2,500	Bluebunch wheatgrass	30
Dagan		Normal	1,700	Oniongrass	10
		Unfavorable	700	Antelope bitterbrush	10
				Big sagebrush	10
				Muttongrass	5
				Prairie junegrass	5
				Idaho fescue	5
				Arrowleaf balsamroot	5
DBF, DCF	Upland Stony Loam	Favorable	1,850	Bluebunch wheatgrass	40
Dagan		Normal	975	Antelope bitterbrush	7
		Unfavorable	700	Nevada bluegrass	7
				Muttongrass	5
				Arrowleaf balsamroot	5
				Black sagebrush	5
				Birchleaf mountainmahogany	5
				Big sagebrush	5
DDF*:					
Dagan	Upland Stony Loam	Favorable	1,850	Bluebunch wheatgrass	40
		Normal	975	Antelope bitterbrush	7
		Unfavorable	700	Nevada bluegrass	7
				Muttongrass	5
				Arrowleaf balsamroot	5
				Black sagebrush	5
				Birchleaf mountainmahogany	5
				Big sagebrush	5
Rubble Land.					
DEE, DFC	Upland Stony Loam	Favorable	1,775	Bluebunch wheatgrass	40
Dennot		Normal	975	Muttongrass	7
		Unfavorable	600	Nevada bluegrass	7
				Needleandthread	7
				Black sagebrush	7
				Sandberg bluegrass	5
				Big sagebrush	5
				Antelope bitterbrush	5
DGF	Mountain Loam	Favorable	2,600	Bluebunch wheatgrass	40
Despain		Normal	1,850	Basin wildrye	8
		Unfavorable	1,200	Bearded wheatgrass	5
				Muttongrass	5
DKD, DLE	Semidesert Stony Loam	Favorable	1,050	Bluebunch wheatgrass	30
Duckree		Normal	600	Indian ricegrass	15
		Unfavorable	475	Shadscale	10
				Sandberg bluegrass	8
				Needleandthread	5
				Bottlebrush squirreltail	5
				Tapertip hawksbeard	5
				Arrowleaf balsamroot	5

See footnote at end of table.

TABLE 4.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site name	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
DMF*:					
Duckree	Semidesert Stony Loam	Favorable	1,050	Bluebunch wheatgrass	30
		Normal	600	Indian ricegrass	15
		Unfavorable	475	Shadscale	10
				Sandberg bluegrass	8
				Needleandthread	5
				Bottlebrush squirreltail	5
				Tapertip hawksbeard	5
				Arrowleaf balsamroot	5
St. Marys	Upland Stony Loam	Favorable	1,850	Bluebunch wheatgrass	40
		Normal	975	Muttongrass	7
		Unfavorable	450	Nevada bluegrass	7
				Antelope bitterbrush	5
EAC, EAE	Upland Loamy Shale	Favorable	650	Low sagebrush	30
Ellett		Normal	450	Rubber rabbitbrush	13
		Unfavorable	200	Hood phlox	12
				Shrubby buckwheat	10
				Bottlebrush squirreltail	7
				Black sagebrush	6
ECE	Mountain Stony Loam	Favorable	2,500	Bluebunch wheatgrass	30
Etchen		Normal	1,700	Bulbous oniongrass	10
		Unfavorable	700	Antelope bitterbrush	10
				Big sagebrush	7
				Idaho fescue	5
				Prairie junegrass	5
FAE, FBC	Upland Shallow Loam	Favorable	2,000	Bluebunch wheatgrass	46
Falula		Normal	1,500	Big sagebrush	8
		Unfavorable	700	Low sagebrush	8
				Sandberg bluegrass	5
FCE*:					
Falula	Upland Shallow Loam	Favorable	2,000	Bluebunch wheatgrass	46
		Normal	1,500	Big sagebrush	8
		Unfavorable	700	Low sagebrush	8
				Sandberg bluegrass	5
Kearl	Upland Loam	Favorable	2,250	Bluebunch wheatgrass	28
		Normal	1,475	Indian ricegrass	10
		Unfavorable	700	Nevada bluegrass	10
				Lanceleaf yellowbrush	7
				Antelope bitterbrush	6
				Big sagebrush	5
FEE*:					
Fontreen	Upland Stony Loam	Favorable	1,850	Bluebunch wheatgrass	40
		Normal	975	Muttongrass	7
		Unfavorable	700	Nevada bluegrass	7
				Black sagebrush	7
				Big sagebrush	5
				Antelope bitterbrush	5
Rexmont	Upland Shallow Loam (Juniper)	Favorable	1,900	Bluebunch wheatgrass	33
		Normal	1,450	Utah juniper	25
		Unfavorable	700	Indian ricegrass	7
				Sandberg bluegrass	7
				Black sagebrush	5
				Low sagebrush	5
FFF, FGE	Mountain Shallow Loam	Favorable	1,700	Bluebunch wheatgrass	25
Foxol		Normal	1,100	Antelope bitterbrush	15
		Unfavorable	600	Muttongrass	10
				Basin wildrye	5
				Nevada bluegrass	5
				Big sagebrush	5

See footnote at end of table.

TABLE 4.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site name	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
GAD---------- Gobine	Upland Loam----------	Favorable	2,250	Bluebunch wheatgrass----------	28
		Normal	1,475	Indian ricegrass----------	10
		Unfavorable	700	Nevada bluegrass----------	10
				Lanceleaf yellowbrush----------	7
				Antelope bitterbrush----------	6
				Big sagebrush----------	5
GBE*:					
Gridge----------	Upland Shallow Loam----------	Favorable	2,000	Bluebunch wheatgrass----------	46
		Normal	1,500	Big sagebrush----------	8
		Unfavorable	700	Low sagebrush----------	8
				Sandberg bluegrass----------	5
Rock outcrop.					
GCE---------- Guilder	Mountain Loam----------	Favorable	2,600	Bluebunch wheatgrass----------	40
		Normal	1,850	Basin wildrye----------	8
		Unfavorable	1,200	Bearded wheatgrass----------	5
				Muttongrass----------	5
HAB---------- Hades	Mountain Loam (Shrub)----------	Favorable	3,200	Bluebunch wheatgrass----------	30
		Normal	2,325	Bearded wheatgrass----------	12
		Unfavorable	1,600	Basin wildrye----------	10
				Mountain snowberry----------	10
				Antelope bitterbrush----------	7
				Big sagebrush----------	7
HBD---------- Hawkins	Mountain Clay----------	Favorable	2,350	Slender wheatgrass----------	40
		Normal	1,600	Bluebunch wheatgrass----------	8
		Unfavorable	750	Idaho fescue----------	5
				Letterman needlegrass----------	5
				Prairie junegrass----------	5
HDC---------- Horrocks	Mountain Stony Loam----------	Favorable	2,300	Gambel oak----------	25
		Normal	1,800	Bluebunch wheatgrass----------	8
		Unfavorable	1,500	Bearded wheatgrass----------	8
				Mountain brome----------	5
				Nevada bluegrass----------	5
				Birchleaf mountainmahogany----	5
JAE, JAF---------- Jebo	Upland Stony Loam----------	Favorable	1,775	Bluebunch wheatgrass----------	40
		Normal	975	Muttongrass----------	7
		Unfavorable	600	Nevada bluegrass----------	7
				Needleandthread----------	7
				Black sagebrush----------	7
				Sandberg bluegrass----------	5
				Big sagebrush----------	5
				Antelope bitterbrush----------	5
KBD, KBE, KBF------ Kearl	Upland Loam----------	Favorable	2,250	Bluebunch wheatgrass----------	28
		Normal	1,475	Indian ricegrass----------	10
		Unfavorable	700	Nevada bluegrass----------	10
				Lanceleaf yellowbrush----------	7
				Antelope bitterbrush----------	6
				Big sagebrush----------	5
KCD*:					
Kearl----------	Upland Loam----------	Favorable	2,250	Bluebunch wheatgrass----------	28
		Normal	1,475	Indian ricegrass----------	10
		Unfavorable	700	Nevada bluegrass----------	10
				Lanceleaf yellowbrush----------	7
				Antelope bitterbrush----------	6
				Big sagebrush----------	5
Richville---------	Upland Loam----------	Favorable	2,250	Bluebunch wheatgrass----------	28
		Normal	1,475	Indian ricegrass----------	10
		Unfavorable	700	Nevada bluegrass----------	10
				Lanceleaf yellowbrush----------	7
				Antelope bitterbrush----------	6

See footnote at end of table.

TABLE 4.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site name	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
LAD---------- Lakridge	Upland Loam----------	Favorable	2,250	Bluebunch wheatgrass----------	28
		Normal	1,475	Indian ricegrass----------	10
		Unfavorable	700	Nevada bluegrass----------	10
				Lanceleaf yellowbrush----------	7
				Antelope bitterbrush----------	6
				Big sagebrush----------	5
LBC---------- Lariat	Semidesert Loam----------	Favorable	1,100	Bluebunch wheatgrass----------	22
		Normal	735	Needleandthread----------	15
		Unfavorable	400	Big sagebrush----------	15
				Bottlebrush squirreltail------	10
				Sandberg bluegrass----------	5
				Arrowleaf balsamroot----------	5
				Winterfat----------	5
LCD, LCE---------- Lonjon	Upland Stony Loam----------	Favorable	1,775	Bluebunch wheatgrass----------	40
		Normal	975	Muttongrass----------	7
		Unfavorable	600	Nevada bluegrass----------	7
				Needleandthread----------	7
				Black sagebrush----------	7
				Sandberg bluegrass----------	5
				Big sagebrush----------	5
				Antelope bitterbrush----------	5
LFF*:					
Lundy----------	Upland Shallow Loam (Juniper)	Favorable	1,900	Bluebunch wheatgrass----------	33
		Normal	1,450	Utah juniper----------	25
		Unfavorable	700	Indian ricegrass----------	7
				Sandberg bluegrass----------	7
				Black sagebrush----------	5
				Low sagebrush----------	5
Rock outcrop.					
MDC*, MDE*:					
Murphy----------	Upland Loam----------	Favorable	2,250	Bluebunch wheatgrass----------	28
		Normal	1,475	Indian ricegrass----------	10
		Unfavorable	700	Nevada bluegrass----------	10
				Lanceleaf yellowbrush----------	7
				Antelope bitterbrush----------	6
				Big sagebrush----------	5
Richville----------	Upland Loam----------	Favorable	2,250	Bluebunch wheatgrass----------	28
		Normal	1,475	Indian ricegrass----------	10
		Unfavorable	700	Nevada bluegrass----------	10
				Lanceleaf yellowbrush----------	7
				Antelope bitterbrush----------	6
NAD---------- Neponset	Semidesert Loam----------	Favorable	1,100	Bluebunch wheatgrass----------	22
		Normal	735	Needleandthread----------	15
		Unfavorable	400	Big sagebrush----------	15
				Bottlebrush squirreltail------	10
				Sandberg bluegrass----------	5
				Arrowleaf balsamroot----------	5
				Winterfat----------	5
NBA---------- Nevka	Alkali Bottoms----------	Favorable	2,500	Inland saltgrass----------	25
		Normal	1,750	Alkali sacaton----------	20
		Unfavorable	1,000	Alkali bluegrass----------	15
				Basin wildrye----------	10
				Sedge----------	5
				Black greasewood----------	5
				Rubber rabbitbrush----------	5
				Alkali cordgrass----------	5

See footnote at end of table.

TABLE 4.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site name	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
PAC, PAD, PAE, PAE2---------- Pancheri	Semidesert Loam----------	Favorable	1,100	Bluebunch wheatgrass----------	22
		Normal	735	Needleandthread----------	15
		Unfavorable	400	Big sagebrush----------	15
				Bottlebrush squirreltail------	10
				Sandberg bluegrass----------	5
				Arrowleaf balsamroot----------	5
				Winterfat----------	5
PBF*:					
Pancheri----------	Semidesert Loam----------	Favorable	1,100	Bluebunch wheatgrass----------	22
		Normal	735	Needleandthread----------	15
		Unfavorable	400	Big sagebrush----------	15
				Bottlebrush squirreltail------	10
				Sandberg bluegrass----------	5
				Arrowleaf balsamroot----------	5
				Winterfat----------	5
Highams Variant---	Semidesert Shallow Loam-------	Favorable	1,000	Bluebunch wheatgrass----------	30
		Normal	725	Indian ricegrass----------	10
		Unfavorable	475	Black sagebrush----------	10
				Needleandthread----------	5
				Sandberg bluegrass----------	5
				Shrubby buckwheat----------	5
				Shadscale----------	5
				Lanceleaf yellowbrush---------	5
				Winterfat----------	5
				Big sagebrush----------	5
Rock outcrop.					
RAD---------- Ramshorn	Semidesert Stony Loam---------	Favorable	1,050	Bluebunch wheatgrass----------	30
		Normal	600	Indian ricegrass----------	15
		Unfavorable	475	Shadscale----------	10
				Sandberg bluegrass----------	8
				Needleandthread----------	5
				Bottlebrush squirreltail------	5
				Tapertip hawksbeard----------	5
				Arrowleaf balsamroot----------	5
				Black sagebrush----------	5
				Big sagebrush----------	5
RBD*, RBE*:					
Ramshorn Variant--	Upland Stony Loam----------	Favorable	1,775	Bluebunch wheatgrass----------	40
		Normal	975	Muttongrass----------	7
		Unfavorable	600	Nevada bluegrass----------	7
				Needleandthread----------	7
				Black sagebrush----------	7
				Sandberg bluegrass----------	5
				Big sagebrush----------	5
				Antelope bitterbrush----------	5
Highams----------	Upland Shallow Loam----------	Favorable	2,000	Bluebunch wheatgrass----------	60
		Normal	1,500	Big sagebrush----------	20
		Unfavorable	700	Low sagebrush----------	20
				Nevada bluegrass----------	10
				Sandberg bluegrass----------	10
				Black sagebrush----------	10
				Arrowleaf balsamroot----------	5
				Antelope bitterbrush----------	5
RE---------- Rich	Alkali Bottoms----------	Favorable	2,500	Saltgrass----------	25
		Normal	1,750	Alkali sacaton----------	20
		Unfavorable	1,000	Alkali bluegrass----------	15
				Basin wildrye----------	10
				Sedge----------	5
				Alkali cordgrass----------	5
				Black greasewood----------	5
				Rubber rabbitbrush----------	5

See footnote at end of table.

TABLE 4.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site name	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
RHC, RHD---------- Richville	Upland Loam----------	Favorable	2,250	Bluebunch wheatgrass----------	28
		Normal	1,475	Indian ricegrass----------	10
		Unfavorable	700	Nevada bluegrass----------	10
				Lanceleaf yellowbrush----------	7
				Antelope bitterbrush----------	6
SB---------- Saleratus	Alkali Bottoms----------	Favorable	2,500	Saltgrass----------	25
		Normal	1,750	Alkali sacaton----------	20
		Unfavorable	1,000	Alkali bluegrass----------	15
				Basin wildrye----------	10
				Sedge----------	5
				Alkali cordgrass----------	5
				Black greasewood----------	5
				Rubber rabbitbrush----------	5
SFD---------- Searla	Upland Stony Loam----------	Favorable	1,775	Bluebunch wheatgrass----------	40
		Normal	975	Mutton bluegrass----------	7
		Unfavorable	600	Nevada bluegrass----------	7
				Needleandthread----------	7
				Black sagebrush----------	7
				Sandberg bluegrass----------	5
				Big sagebrush----------	5
				Antelope bitterbrush----------	5
SGF---------- Slinger	Semidesert Stony Loam----------	Favorable	1,050	Bluebunch wheatgrass----------	30
		Normal	600	Indian ricegrass----------	15
		Unfavorable	475	Shadscale----------	10
				Sandberg bluegrass----------	8
				Needleandthread----------	5
				Bottlebrush squirreltail------	5
				Tapertip hawksbeard----------	5
				Arrowleaf balsamroot----------	5
				Black sagebrush----------	5
				Big sagebrush----------	5
SHF---------- Solak	Upland Shallow Loam----------	Favorable	2,000	Bluebunch wheatgrass----------	50
		Normal	1,500	Big sagebrush----------	8
		Unfavorable	650	Low sagebrush----------	8
				Sandberg bluegrass----------	5
				Western wheatgrass----------	5
SLE---------- St. Marys	Mountain Gravelly Loam--------	Favorable	2,500	Bluebunch wheatgrass----------	25
		Normal	1,500	Nevada bluegrass----------	10
		Unfavorable	700	Muttongrass----------	8
				Bulbous oniongrass----------	8
				Antelope bitterbrush----------	8
				Idaho fescue----------	5
				Prairie junegrass----------	5
				Big sagebrush----------	5
SME*:					
St. Marys---------	Mountain Gravelly Loam--------	Favorable	2,500	Bluebunch wheatgrass----------	25
		Normal	1,500	Nevada bluegrass----------	10
		Unfavorable	700	Muttongrass----------	8
				Bulbous oniongrass----------	8
				Antelope bitterbrush----------	8
				Idaho fescue----------	5
				Prairie junegrass----------	5
				Big sagebrush----------	5
Yeljack.					
SNF---------- Sumine	Upland Stony Loam----------	Favorable	1,775	Bluebunch wheatgrass----------	45
		Normal	975	Big sagebrush----------	10
		Unfavorable	600	Muttongrass----------	8
				Needleandthread----------	5
				Nevada bluegrass----------	5
				Antelope bitterbrush----------	5

See footnote at end of table.

TABLE 4.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site name	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
TAB, TAD, TAE, TBA, TBB, TBC, TBD----- Thatcher	Upland Loam----------	Favorable	2,250	Bluebunch wheatgrass----------	28
		Normal	1,475	Indian ricegrass----------	10
		Unfavorable	700	Nevada bluegrass----------	10
				Lanceleaf yellowbrush----------	7
				Antelope bitterbrush----------	6
				Big sagebrush----------	5
VAE, VAF---------- Vanni	Upland Loam----------	Favorable	2,250	Bluebunch wheatgrass----------	28
		Normal	1,475	Indian ricegrass----------	10
		Unfavorable	700	Nevada bluegrass----------	10
				Lanceleaf yellowbrush----------	7
				Antelope bitterbrush----------	6
				Big sagebrush----------	5
VCD---------- Vicking	Upland Loam----------	Favorable	2,250	Bluebunch wheatgrass----------	28
		Normal	1,475	Indian ricegrass----------	10
		Unfavorable	700	Nevada bluegrass----------	10
				Lanceleaf yellowbrush----------	7
				Antelope bitterbrush----------	6
				Big sagebrush----------	5
WA---------- Wader	Semiwet Meadow----------	Favorable	4,200	Sedge----------	35
		Normal	2,500	Slender wheatgrass----------	15
		Unfavorable	1,750	Basin wildrye----------	10
				Tufted hairgrass----------	10
				Alkali bluegrass----------	5
				Redtop----------	5
				Clover----------	5
				Rubber rabbitbrush----------	5
WB---------- Wader	Alkali Bottoms----------	Favorable	2,500	Saltgrass----------	25
		Normal	1,750	Alkali sacaton----------	20
		Unfavorable	1,000	Alkali bluegrass----------	15
				Basin wildrye----------	10
				Sedge----------	5
				Alkali cordgrass----------	5
				Black greasewood----------	5
				Rubber rabbitbrush----------	5
WC---------- Wader Variant	Wet Meadow----------	Favorable	6,500	Tufted hairgrass----------	25
		Normal	5,000	Sedge----------	15
		Unfavorable	3,500	Nebraska sedge----------	10
				Baltic rush----------	10
				Kentucky bluegrass----------	5
				Redtop----------	5
				Creeping wildrye----------	5
				Meadow foxtail----------	5
WDC---------- Woodpass	Semidesert Loam----------	Favorable	1,100	Bluebunch wheatgrass----------	22
		Normal	735	Needleandthread----------	15
		Unfavorable	400	Big sagebrush----------	15
				Bottlebrush squirreltail----------	10
				Sandberg bluegrass----------	5
				Arrowleaf balsamroot----------	5
				Winterfat----------	5
YAE---------- Yeates Hollow	Mountain Gravelly Loam--------	Favorable	2,400	Bluebunch wheatgrass----------	30
		Normal	1,700	Birchleaf mountainmahogany----	15
		Unfavorable	1,200	Nevada bluegrass----------	12
				Muttongrass----------	10
				Longtongue muttongrass--------	5
YBD*:					
Yeates Hollow-----	Mountain Gravelly Loam--------	Favorable	2,400	Bluebunch wheatgrass----------	30
		Normal	1,700	Birchleaf mountainmahogany----	15
		Unfavorable	1,200	Nevada bluegrass----------	12
				Muttongrass----------	10
				Longtongue muttongrass--------	5

See footnote at end of table.

TABLE 4.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site name	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
YBD*:					
Obray	Mountain Clay	Favorable	2,350	Slender wheatgrass	40
		Normal	1,600	Bluebunch wheatgrass	8
		Unfavorable	750	Idaho fescue	5
				Letterman needlegrass	5
				Prairie junegrass	5
ZAD*:					
Zagg	Semidesert Clay	Favorable	800	Western wheatgrass	25
		Normal	600	Nuttall saltbush	20
		Unfavorable	400	Winterfat	15
				Sandberg bluegrass	5
				Nevada bluegrass	5
				Needleandthread	5
				Indian ricegrass	5
				Low sagebrush	5
Zagg	Semidesert Clay	Favorable	800	Western wheatgrass	25
		Normal	600	Nuttall saltbush	20
		Unfavorable	400	Winterfat	15
				Sandberg bluegrass	5
				Nevada bluegrass	5
				Needleandthread	5
				Indian ricegrass	5
				Low sagebrush	5
ZBC	Semidesert Clay	Favorable	800	Western wheatgrass	25
Zegro		Normal	600	Nuttall saltbush	20
		Unfavorable	400	Winterfat	15
				Sandberg bluegrass	5
				Nevada bluegrass	5
				Needleandthread	5
				Indian ricegrass	5
				Low sagebrush	5
ZCD*:					
Zegro	Semidesert Clay	Favorable	800	Western wheatgrass	25
		Normal	600	Nuttall saltbush	20
		Unfavorable	400	Winterfat	15
				Sandberg bluegrass	5
				Nevada bluegrass	5
				Needleandthread	5
				Indian ricegrass	5
				Low sagebrush	5
Zagg	Semidesert Clay	Favorable	800	Western wheatgrass	25
		Normal	600	Nuttall saltbush	20
		Unfavorable	400	Winterfat	15
				Sandberg bluegrass	5
				Nevada bluegrass	5
				Needleandthread	5
				Indian ricegrass	5
				Low sagebrush	5

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 5.--WOODLAND MANAGEMENT AND PRODUCTIVITY

[Only the soils suitable for production of trees are listed. Absence of an entry indicates that information was not available]

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity	
		Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Common trees	Site index
AAD*, AAF*: Aggassiz.							
Mult	---	---	---	---	---	Douglas-fir Subalpine-fir Engelmann spruce	--- --- ---
BAD Baird Hollow	4o	Slight	Slight	Slight	Slight	Quaking aspen	52
CDD, CDE Condie	4f	Slight	Slight	Slight	Moderate	Douglas-fir Lodgepole pine	55 55
EBD, EBE Ercan	3o	Slight	Slight	Slight	Slight	Quaking aspen	64
FDF Flygare	2f	Moderate	Slight	Slight	Slight	Quaking aspen	73
HEF Hourglass	7f	Severe	Severe	Moderate	Moderate	Douglas-fir Subalpine fir Quaking aspen	35 --- ---
LDD Lucky Star	2f	Slight	Slight	Slight	Moderate	Quaking aspen	77
LDF Lucky Star	2f	Moderate	Slight	Slight	Moderate	Quaking aspen	77
LEF*:							
Lucky Star	2f	Moderate	Slight	Slight	Moderate	Quaking aspen	77
Condie	6f	Moderate	Moderate	Slight	Moderate	Douglas-fir Lodgepole pine	44 44
MCD*:							
Mult	---	---	---	---	---	Douglas-fir Subalpine-fir Engelmann spruce	--- --- ---
Agassiz.							
RCG*:							
Rexmont	3d	Severe	Severe	Slight	Severe	Utah juniper	50
Rock outcrop.							
RFD Richens	---	---	---	---	---	Quaking aspen	---
RGF*:							
Richens	---	---	---	---	---	Quaking aspen	---
Agassiz.							
SDF Sambrito	3o	Moderate	Moderate	Slight	Slight	Douglas-fir Subalpine fir Lodgepole pine	50 --- 80
SEE Scout	4f	Moderate	Slight	Slight	Moderate	Douglas-fir	55
SJF Solak	3d	Severe	Severe	Slight	Severe	Utah juniper	15

See footnote at end of table.

TABLE 5.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity	
		Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Common trees	Site index
SKF*:							
Solak	3d	Severe	Severe	Slight	Severe	Utah juniper	35
Ranruff	3d	Severe	Severe	Slight	Severe	Utah juniper	35
Rock outcrop.							
SME*:							
St. Marys.							
Yeljack	3o	Slight	Slight	Slight	Slight	Quaking aspen	64
VBF	2r	Severe	Severe	Slight	Severe	Utah juniper	55
Vanni							
YDE	3o	Slight	Slight	Slight	Slight	Quaking aspen	64
Yeljack							
YEE*:							
Yeljack	3o	Slight	Slight	Slight	Slight	Quaking aspen	64
Cluff.							

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 6.--WOODLAND UNDERSTORY VEGETATION

[Only the soils suitable for production of trees are listed]

Soil name and map symbol	Total production		Characteristic vegetation	Composition
	Kind of year	Dry weight		
		Lb/acre		Pct
AAD*, AAF*: Agassiz.				
Mult	Favorable	5,300	Quaking aspen	35
	Normal	3,050	Blue wildrye	7
	Unfavorable	2,000	Mountain brome	7
			Bearded wheatgrass	5
			Nodding bluegrass	5
			Nodding bromegrass	5
BAD	Favorable	5,300	Quaking aspen	35
Baird Hollow	Normal	3,050	Blue wildrye	7
	Unfavorable	2,000	Mountain brome	7
			Bearded wheatgrass	5
			Nodding bluegrass	5
			Nodding bromegrass	5
CDD, CDE	Favorable	---	Pinegrass	---
Condie	Normal	---	Myrtle pachystima	---
	Unfavorable	---	Snowberry	---
EBD, EBE	Favorable	5,300	Quaking aspen	35
Ercan	Normal	3,050	Blue wildrye	7
	Unfavorable	2,000	Mountain brome	7
			Bearded wheatgrass	5
			Nodding bluegrass	5
			Nodding bromegrass	5
FDF	Favorable	5,300	Quaking aspen	35
Flygare	Normal	3,050	Blue wildrye	7
	Unfavorable	2,000	Mountain brome	7
			Bearded wheatgrass	5
			Nodding bluegrass	5
			Nodding bromegrass	5
HEF	Favorable	5,300	Quaking aspen	35
Hourglass	Normal	3,050	Blue wildrye	7
	Unfavorable	2,000	Mountain brome	7
			Bearded wheatgrass	5
			Nodding bluegrass	5
			Nodding bromegrass	5
LDD, LDF	Favorable	5,300	Quaking aspen	35
Lucky Star	Normal	3,050	Blue wildrye	7
	Unfavorable	2,000	Mountain brome	7
			Bearded wheatgrass	5
			Nodding bluegrass	5
			Nodding bromegrass	5
LEF*:				
Lucky Star	Favorable	5,300	Quaking aspen	35
	Normal	3,050	Blue wildrye	7
	Unfavorable	2,000	Mountain brome	7
			Bearded wheatgrass	5
			Nodding bluegrass	5
			Nodding bromegrass	5
Condie	Favorable	---	Pinegrass	---
	Normal	---	Myrtle pachystima	---
	Unfavorable	---	Snowberry	---

See footnote at end of table.

TABLE 6.--WOODLAND UNDERSTORY VEGETATION--Continued

Soil name and map symbol	Total production		Characteristic vegetation	Composition
	Kind of year	Dry weight		
		Lb/acre		Pct
MCD*:				
Mult	Favorable	5,300	Quaking aspen	35
	Normal	3,050	Blue wildrye	7
	Unfavorable	2,000	Mountain brome	7
			Bearded wheatgrass	5
			Nodding bluegrass	5
			Nodding bromegrass	5
Agassiz.				
RCG*:				
Rexmont	Favorable	1,900	Bluebunch wheatgrass	33
	Normal	1,450	Utah juniper	25
	Unfavorable	700	Indian ricegrass	7
			Sandberg bluegrass	7
			Black sagebrush	5
			Low sagebrush	5
Rock outcrop.				
RFD	Favorable	5,300	Quaking aspen	35
Richens	Normal	3,050	Blue wildrye	7
	Unfavorable	2,000	Mountain brome	7
			Bearded wheatgrass	5
			Nodding bluegrass	5
			Nodding bromegrass	5
RGF*:				
Richens	Favorable	5,300	Quaking aspen	35
	Normal	3,050	Blue wildrye	7
	Unfavorable	2,000	Mountain brome	7
			Bearded wheatgrass	5
			Nodding bluegrass	5
			Nodding bromegrass	5
Agassiz.				
SDF	Favorable	250	Dwarf blueberry	20
Sambrito	Normal	200	Spike trisetum	10
	Unfavorable	150	Myrtle pachystima	10
			Oregon-grape	10
			Russet buffaloberry	5
			Elk sedge	5
			Lupine	5
			Bluegrass	5
SEE	Favorable	---	Bearded wheatgrass	---
Scout	Normal	---	Nodding bluegrass	---
	Unfavorable	---	Nodding bromegrass	---
			Blue wildrye	---
			Mountain brome	---
SJF	Favorable	550	Bluebunch wheatgrass	20
Solak	Normal	400	Utah juniper	20
	Unfavorable	275	Indian ricegrass	10
			Nevada bluegrass	5
			Globemallow	5
			Black sagebrush	5
SKF*:				
Solak	Favorable	1,900	Bluebunch wheatgrass	33
	Normal	1,450	Utah juniper	25
	Unfavorable	700	Indian ricegrass	7
			Sandberg bluegrass	7
			Low sagebrush	5
			Black sagebrush	5

See footnote at end of table.

TABLE 6.--WOODLAND UNDERSTORY VEGETATION--Continued

Soil name and map symbol	Total production		Characteristic vegetation	Composition
	Kind of year	Dry weight		
		Lb/acre		Pct
SKF*:				
Ranruff	Favorable	1,900	Bluebunch wheatgrass	33
	Normal	1,450	Utah juniper	25
	Unfavorable	700	Indian ricegrass	7
			Sandberg bluegrass	7
			Black sagebrush	5
			Low sagebrush	5
Rock outcrop.				
SME*:				
St. Marys.				
Yeljack	Favorable	5,300	Quaking aspen	35
	Normal	3,050	Mountain brome	19
	Unfavorable	2,000	Bearded wheatgrass	5
			Nodding bromegrass	5
			Aspen peavine	5
VBF	Favorable	1,675	Bluebunch wheatgrass	30
Vanni	Normal	1,175	Utah juniper	27
	Unfavorable	625	Indian ricegrass	10
			Antelope bitterbrush	10
			Western wheatgrass	8
			Arrowleaf balsamroot	5
YDE	Favorable	5,300	Quaking aspen	35
Yeljack	Normal	3,050	Mountain brome	19
	Unfavorable	2,000	Bearded wheatgrass	5
			Nodding bromegrass	5
			Aspen peavine	5
YEE*:				
Yeljack	Favorable	5,300	Quaking aspen	35
	Normal	3,050	Mountain brome	19
	Unfavorable	2,000	Bearded wheatgrass	5
			Nodding bromegrass	5
			Aspen peavine	5
Cluff.				

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 7.--RECREATIONAL DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
AAD*:					
Agassiz	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones, depth to rock.	Moderate: large stones, slope.	Severe: large stones, slope, thin layer.
Mult	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
AAF*:					
Agassiz	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope.	Severe: large stones, slope, thin layer.
Mult	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
ABF*:					
Agassiz	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, thin layer.
Richville	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
ACF*:					
Agassiz	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, thin layer.
Rock outcrop.					
ADD	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
Alhark					
ADE	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Alhark					
AEC	Moderate: dusty.	Moderate: dusty.	Severe: slope.	Severe: erodes easily.	Slight.
Alhark					
AFD	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope, dusty.	Severe: slope.
Ant Flat					
BAD	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Baird Hollow					
BB, BC	Severe: flooding, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Bear Lake					
BD	Severe: flooding, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, erodes easily.	Severe: ponding.
Bear Lake					
BEF	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope.	Severe: small stones, droughty, slope.
Bequinn					

See footnote at end of table.

TABLE 7.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
BFB---- Bereniceton	Severe: flooding.	Moderate: dusty.	Moderate: slope, dusty.	Severe: erodes easily.	Slight.
BGE---- Bereniceton	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope, dusty.	Severe: slope.
BHA---- Bockston	Severe: flooding.	Moderate: dusty.	Moderate: dusty.	Moderate: dusty.	Slight.
BHB---- Bockston	Moderate: dusty.	Moderate: dusty.	Moderate: slope, dusty.	Moderate: dusty.	Slight.
BJC---- Bullnel	Moderate: slope, dusty.	Moderate: slope, dusty.	Severe: slope.	Moderate: dusty.	Moderate: slope, thin layer.
BJE---- Bullnel	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope, dusty.	Severe: slope.
CA---- Canburn	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.	Severe: wetness, flooding.
CBD*: Cloud Rim----	Moderate: slope, dusty.	Moderate: slope, dusty.	Severe: slope.	Moderate: dusty.	Moderate: slope.
McCarey----	Moderate: slope, dusty.	Moderate: slope, dusty.	Severe: slope.	Moderate: dusty.	Moderate: slope, thin layer.
CCE---- Cluff	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
CDD, CDE---- Condie	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
CEA---- Cowco	Severe: flooding.	Moderate: percs slowly.	Moderate: percs slowly.	Severe: erodes easily.	Slight.
CEB---- Cowco	Moderate: dusty.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Severe: erodes easily.	Slight.
CFA---- Cowco	Severe: excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Severe: erodes easily.	Severe: excess sodium.
CGD---- Cutoff	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope.	Severe: slope.
CGF---- Cutoff	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
CHF*: Cutoff----	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.

See footnote at end of table.

TABLE 7.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
CHF*:					
Falula	Severe: small stones, depth to rock.	Severe: small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: small stones.	Severe: small stones, thin layer.
DAF	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
DBF	Severe: slope, small stones.	Severe: slope, small stones.	Severe: large stones, slope, small stones.	Severe: slope.	Severe: small stones, slope.
DCF	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
DDF*:					
Dagan	Severe: slope, small stones.	Severe: slope, small stones.	Severe: large stones, slope, small stones.	Severe: slope.	Severe: small stones, slope.
Rubble Land.					
DEE	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
DFC	Severe: small stones.	Severe: small stones.	Severe: slope, small stones.	Moderate: dusty.	Severe: small stones.
DGF	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
DHB	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight	Moderate: small stones.
DJA	Severe: flooding.	Moderate: dusty.	Moderate: small stones, dusty.	Moderate: dusty.	Moderate: droughty.
DKD, DLE	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
DMF*:					
Duckree	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
St. Marys	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: large stones, dusty.	Severe: slope.
EAC	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: erodes easily.	Severe: thin layer.
EAE	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: erodes easily.	Severe: slope, thin layer.
EBD	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.

See footnote at end of table.

TABLE 7.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
EBE---------- Ercan	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
ECE---------- Etchen	Severe: slope, small stones, large stones.	Severe: slope, large stones, small stones.	Severe: large stones, slope, small stones.	Severe: large stones, slope.	Severe: small stones, large stones, slope.
FAE---------- Falula	Severe: small stones, depth to rock.	Severe: small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: small stones.	Severe: small stones, thin layer.
FBC---------- Falula	Severe: depth to rock.	Severe: depth to rock.	Severe: small stones, depth to rock.	Moderate: dusty.	Severe: thin layer.
FCE*: Falula----------	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, small stones, depth to rock.	Moderate: dusty.	Severe: thin layer.
Kearl----------	Moderate: slope, dusty.	Moderate: slope, dusty.	Severe: slope.	Moderate: dusty.	Moderate: slope, thin layer.
FDF---------- Flygare	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: large stones, slope.
FEE*: Fontreen----------	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
Rexmont----------	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, small stones, depth to rock.	Slight----------	Severe: thin layer.
FFF, FGE---------- Foxol	Severe: slope, small stones.	Severe: slope, small stones.	Severe: large stones, slope, small stones.	Severe: large stones, slope.	Severe: small stones, large stones, thin layer.
GAD---------- Gobine	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, small stones, percs slowly.	Severe: erodes easily.	Slight.
GBE*: Gridge----------	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope.	Severe: slope, thin layer.
Rock outcrop.					
GCE---------- Guilder	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope, dusty.	Severe: slope.
HAB---------- Hades	Moderate: dusty.	Moderate: dusty.	Moderate: slope, small stones, dusty.	Moderate: dusty.	Slight.

See footnote at end of table.

TABLE 7.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
HBD Hawkins	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
HC Hival	Severe: flooding, percs slowly.	Severe: percs slowly.	Severe: percs slowly.	Severe: erodes easily.	Moderate: wetness.
HDC Horrocks	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Slight	Moderate: large stones, slope.
HEF Hourglass	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
JAE Jebo	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Moderate: slope.	Severe: small stones, slope.
JAF Jebo	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope.	Severe: small stones, slope.
KAF Kamack	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
KBD Kearl	Moderate: slope, dusty.	Moderate: slope, dusty.	Severe: slope.	Moderate: dusty.	Moderate: slope, thin layer.
KBE Kearl	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope, dusty.	Severe: slope.
KBF Kearl	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
KCD*: Kearl	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: droughty, slope, thin layer.
Richville	Moderate: dusty.	Moderate: dusty.	Severe: slope.	Severe: erodes easily.	Moderate: thin layer.
LAD Lakridge	Slight	Slight	Severe: slope.	Severe: erodes easily.	Moderate: thin layer.
LBC Lariat	Slight	Slight	Severe: slope.	Slight	Moderate: droughty, thin layer.
LCD Lonjon	Moderate: dusty.	Moderate: dusty.	Severe: slope.	Moderate: dusty.	Moderate: thin layer.
LCE Lonjon	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope, dusty.	Severe: slope.
LDD Lucky Star	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope.	Severe: slope.
LDF Lucky Star	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.

See footnote at end of table.

TABLE 7.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
LEF*:					
Lucky Star	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
Condie	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
LFF*:					
Lundy	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: small stones, slope, thin layer.
Rock outcrop.					
MAA Matheson	Severe: flooding.	Slight	Slight	Slight	Moderate: droughty.
MBE*:					
Mirror Lake	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: droughty, slope.
Sambrito	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
MCD*:					
Mult	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Agassiz	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones, depth to rock.	Moderate: large stones, slope.	Severe: large stones, slope, thin layer.
MDC*:					
Murphy	Slight	Slight	Severe: slope.	Slight	Slight.
Richville	Moderate: dusty.	Moderate: dusty.	Severe: slope.	Severe: erodes easily.	Moderate: thin layer.
MDE*:					
Murphy	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Richville	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
NAD Neponset	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope, thin layer.
NBA Nevka	Severe: flooding, excess sodium, excess salt.	Severe: excess sodium, excess salt.	Severe: excess sodium, excess salt.	Severe: erodes easily.	Severe: excess salt, excess sodium.
NCA Nevka	Severe: flooding.	Moderate: wetness, dusty.	Moderate: wetness, dusty.	Severe: erodes easily.	Moderate: wetness.
PAC Pancheri	Moderate: dusty.	Moderate: dusty.	Moderate: slope, dusty.	Severe: erodes easily.	Slight.

See footnote at end of table.

TABLE 7.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
PAD---------- Pancheri	Moderate: dusty.	Moderate: dusty.	Severe: slope.	Severe: erodes easily.	Slight.
PAE, PAE2---------- Pancheri	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
PBF*: Pancheri----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
Highams Variant------	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope.	Severe: slope, thin layer.
Rock outcrop.					
PD*: Pits.					
Dumps.					
RAD---------- Ramshorn	Severe: excess sodium.	Severe: excess sodium.	Severe: slope, small stones, excess sodium.	Moderate: dusty.	Severe: excess sodium.
RBD*: Ramshorn Variant-----	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Slight----------	Moderate: small stones, droughty, slope.
Highams----------	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Moderate: dusty.	Severe: thin layer.
RBE*: Ramshorn Variant-----	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
Highams----------	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, thin layer.
RCG*: Rexmont----------	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope.	Severe: slope, thin layer.
Rock outcrop.					
RD---------- Rich	Severe: flooding, excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Slight----------	Severe: excess sodium.
RE---------- Rich	Severe: flooding.	Moderate: percs slowly.	Moderate: percs slowly.	Severe: erodes easily.	Slight.
RFD---------- Richens	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.

See footnote at end of table.

TABLE 7.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
RGF*:					
Richens	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Agassiz	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope.	Severe: large stones, slope, thin layer.
RHC	Moderate: dusty.	Moderate: dusty.	Severe: slope.	Severe: erodes easily.	Moderate: thin layer.
RHD	Moderate: slope, dusty.	Moderate: slope, dusty.	Severe: slope.	Severe: erodes easily.	Moderate: slope, thin layer.
SA	Severe: flooding.	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Severe: erodes easily.	Moderate: wetness.
SB	Severe: flooding, excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Severe: erodes easily.	Severe: excess sodium.
SC*:					
Saleratus Variant	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, droughty.
Canburn Variant	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
SDF	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
SEE	Severe: slope, small stones.	Severe: slope, small stones.	Severe: large stones, slope, small stones.	Severe: slope.	Severe: small stones, large stones.
SFD	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: small stones.	Severe: small stones, slope.
SGF	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
SHF, SJF	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones.	Severe: slope.	Severe: slope, thin layer.
SKF*:					
Solak	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: large stones, slope, small stones.	Severe: slope.	Severe: small stones, slope, thin layer.
Ranruff	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope.	Severe: slope, thin layer.
Rock outcrop.					
SLE	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: dusty.	Severe: slope.

See footnote at end of table.

TABLE 7.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
SME*:					
St. Marys	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: dusty.	Severe: slope.
Yeljack	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
SNF:					
Sumine	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
TAB:					
Thatcher	Moderate: dusty.	Moderate: dusty.	Moderate: slope, dusty.	Moderate: dusty.	Slight.
TAD:					
Thatcher	Moderate: dusty.	Moderate: dusty.	Severe: slope.	Moderate: dusty.	Slight.
TAE:					
Thatcher	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope, dusty.	Severe: slope.
TBA, TBB:					
Thatcher	Moderate: dusty.	Moderate: dusty.	Moderate: slope, dusty.	Moderate: dusty.	Slight.
TBC:					
Thatcher	Moderate: slope, dusty.	Moderate: slope, dusty.	Severe: slope.	Moderate: dusty.	Moderate: slope.
TBD:					
Thatcher	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope, dusty.	Severe: slope.
VAE:					
Vanni	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope, dusty.	Severe: slope.
VAF:					
Vanni	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
VBF:					
Vanni	Severe: slope.	Severe: slope.	Severe: large stones, slope, small stones.	Severe: slope.	Severe: large stones, slope.
VCD:					
Vicking	Moderate: slope, dusty.	Moderate: slope, dusty.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
WA:					
Wader	Severe: flooding.	Moderate: wetness, flooding.	Severe: flooding.	Moderate: wetness, flooding.	Severe: flooding.
WB:					
Wader	Severe: flooding, excess sodium, excess salt.	Severe: excess sodium, excess salt.	Severe: flooding, excess sodium, excess salt.	Moderate: flooding.	Severe: excess salt, flooding.
WC:					
Wader Variant	Severe: flooding, wetness.	Moderate: wetness, small stones.	Severe: small stones, wetness.	Moderate: wetness.	Severe: droughty.
WDC:					
Woodpass	Moderate: percs slowly, dusty.	Moderate: dusty.	Moderate: slope, small stones, dusty.	Moderate: dusty.	Slight.

See footnote at end of table.

TABLE 7.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
YAE Yeates Hollow	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Slight	Moderate: small stones, droughty.
YBD*: Yeates Hollow	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope, dusty.	Severe: slope.
Obray	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
YCD, YDE Yeljack	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
YEE*: Yeljack	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Cluff	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
ZAD*: Zagg	Moderate: slope, small stones, percs slowly.	Moderate: slope, small stones, percs slowly.	Severe: slope, small stones.	Slight	Moderate: small stones, slope.
Zagg	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Severe: erodes easily.	Slight.
ZBC Zegro	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, depth to rock, percs slowly.	Severe: erodes easily.	Moderate: thin layer.
ZCD*: Zegro	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope, thin layer.
Zagg	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Severe: erodes easily.	Slight.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 8.--WILDLIFE HABITAT POTENTIALS

[See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
AAD*, AAF*:											
Agassiz	Very poor.	Very poor.	Poor	Poor	Poor	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Poor.
Mult	Very poor.	Very poor.	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.	Good.
ABF*:											
Agassiz	Very poor.	Very poor.	Poor	Poor	Poor	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Poor.
Richville	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.	Fair.
ACF*:											
Agassiz	Very poor.	Very poor.	Poor	Poor	Poor	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Poor.
Rock outcrop.											
ADD, ADE Alhark	Poor	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.	Fair.
AEC Alhark	Fair	Fair	Fair	Fair	Fair	Poor	Very poor.	Fair	Fair	Very poor.	Fair.
AFD Ant Flat	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.	Fair.
BAD Baird Hollow	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.	Good.
BB Bear Lake	Very poor.	Poor	Fair	Fair	Fair	Good	Good	Poor	Fair	Good	Fair.
BC, BD Bear Lake	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Good	Good	Very poor.	Very poor.	Good	Very poor.
BEF Bequinn	Very poor.	Very poor.	Poor	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Poor.
BFB Bereniceton	Fair	Fair	Fair	Poor	Fair	Poor	Very poor.	Fair	Fair	Very poor.	Fair.
BGE Bereniceton	Poor	Poor	Fair	Poor	Fair	Poor	Very poor.	Poor	Fair	Very poor.	Fair.
BHA, BHB Bockston	Poor	Poor	Fair	Poor	Fair	Poor	Very poor.	Poor	Fair	Very poor.	Fair.
BJC, BJE Bullnel	Poor	Poor	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.	Fair.
CA Canburn	Very poor.	Poor	Fair	Fair	Fair	Good	Fair	Poor	Fair	Good	Fair.
CBD*:											
Cloud Rim	Very poor.	Very poor.	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.	Good.

See footnote at end of table.

TABLE 8.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
CBD*: McCarey	Poor	Poor	Fair	Poor	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.	Fair.
CCE---- Cluff	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.	Good.
CDD, CDE---- Condie	Very poor.	Very poor.	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.	Good.
CEA, CEB---- Cowco	Poor	Poor	Fair	Poor	Fair	Poor	Very poor.	Poor	Poor	Very poor.	Fair.
CFA---- Cowco	Very poor.	Very poor.	Poor	Poor	Poor	Poor	Very poor.	Very poor.	Poor	Very poor.	Poor.
CGD, CGF---- Cutoff	Poor	Poor	Fair	Poor	Fair	Poor	Very poor.	Poor	Fair	Very poor.	Fair.
CHF*: Cutoff----	Poor	Poor	Fair	Poor	Fair	Poor	Very poor.	Poor	Fair	Very poor.	Fair.
Falula----	Very poor.	Very poor.	Poor	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Poor.
DAF---- Dagan	Poor	Poor	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.	Fair.
DBF---- Dagan	Very poor.	Very poor.	Fair	Poor	Fair	Very poor.	Very poor.	Poor	Poor	Very poor.	Fair.
DCF---- Dagan	Poor	Poor	Fair	Poor	Fair	Very poor.	Very poor.	Poor	Poor	Very poor.	Fair.
DDF*: Dagan----	Very poor.	Very poor.	Fair	Poor	Fair	Very poor.	Very poor.	Poor	Poor	Very poor.	Fair.
Rubble Land.											
DEE, DFC---- Dennot	Poor	Poor	Fair	Poor	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.	Fair.
DGF---- Despain	Very poor.	Very poor.	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.	Good.
DHB---- Despain Variant	Fair	Fair	Good	Good	Good	Poor	Very poor.	Fair	Good	Very poor.	Good.
DJA---- Duckree	Poor	Poor	Fair	Poor	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.	Fair.
DKD, DLE---- Duckree	Very poor.	Very poor.	Poor	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Poor.
DMF*: Duckree----	Very poor.	Very poor.	Poor	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Poor.
St. Marys----	Very poor.	Very poor.	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.	Fair.
EAC, EAE---- Ellett	Very poor.	Very poor.	Poor	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Poor.
EBD, EBE---- Ercan	Very poor.	Very poor.	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.	Good.

See footnote at end of table.

TABLE 8.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
ECE---------- Etchen	Very poor.	Very poor.	Fair	Poor	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.	Fair.
FAE, FBC---------- Falula	Very poor.	Very poor.	Poor	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Poor.
FCE*:											
Falula----------	Very poor.	Very poor.	Poor	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Poor.
Kearl----------	Poor	Poor	Fair	Poor	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.	Fair.
FDF---------- Flygare	Very poor.	Very poor.	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.	Good.
FEE*:											
Fontreen----------	Poor	Poor	Fair	Poor	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.	Fair.
Rexmont----------	Very poor.	Very poor.	Poor	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Poor.
FFF, FGE---------- Foxol	Very poor.	Very poor.	Poor	Poor	Poor	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Poor.
GAD---------- Gobine	Fair	Fair	Fair	Good	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.	Fair.
GBE*:											
Gridge----------	Very poor.	Very poor.	Poor	Poor	Poor	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Poor.
Rock outcrop.											
GCE---------- Guilder	Poor	Poor	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.	Good.
HAB---------- Hades	Fair	Fair	Good	Good	Good	Poor	Very poor.	Fair	Good	Very poor.	Good.
HBD---------- Hawkins	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.	Good.
HC---------- Hival	Poor	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good	Fair.
HDC---------- Horrocks	Very poor.	Very poor.	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.	Fair.
HEF---------- Hourglass	Very poor.	Very poor.	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.	Good.
JAE, JAF---------- Jebo	Very poor.	Very poor.	Poor	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Poor.
KAF---------- Kamack	Very poor.	Very poor.	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.	Good.
KBD, KBE, KBF------- Kearl	Poor	Poor	Fair	Poor	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.	Fair.
KCD*:											
Kearl----------	Poor	Poor	Fair	Poor	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.	Fair.
Richville----------	Poor	Poor	Fair	Poor	Fair	Very poor.	Very poor.	Poor	Poor	Very poor.	Fair.

See footnote at end of table.

TABLE 8.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
LAD---------- Lakridge	Poor	Fair	Fair	Poor	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.	Fair.
LBC---------- Lariat	Very poor.	Very poor.	Poor	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Poor.
LCD---------- Lonjon	Poor	Poor	Fair	Poor	Fair	Poor	Very poor.	Poor	Fair	Very poor.	Fair.
LCE---------- Lonjon	Poor	Poor	Fair	Poor	Fair	Very poor.	Very poor.	Poor	Good	Very poor.	Good.
LDD, LDF---------- Lucky Star	Very poor.	Very poor.	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.	Good.
LEF*: Lucky Star----------	Very poor.	Very poor.	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.	Good.
Condie----------	Very poor.	Very poor.	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.	Good.
LFF*: Lundy----------	Very poor.	Very poor.	Poor	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Poor.
Rock outcrop.											
MAA---------- Matheson	Poor	Poor	Fair	Fair	Fair	Fair	Very poor.	Poor	Fair	Poor	Fair.
MBE*: Mirror Lake---------	Very poor.	Very poor.	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.	Fair.
Sambrito----------	Poor	Poor	Good	Good	Fair	Very poor.	Very poor.	Fair	Good	Very poor.	---
MCD*: Mult----------	Very poor.	Very poor.	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.	Good.
Agassiz----------	Very poor.	Very poor.	Poor	Poor	Poor	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Poor.
MDC*, MDE*: Murphy----------	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.	Fair.
Richville----------	Poor	Poor	Fair	Poor	Fair	Very poor.	Very poor.	Poor	Poor	Very poor.	Fair.
NAD---------- Neponset	Very poor.	Very poor.	Poor	Very poor.	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.	Poor.
NBA---------- Nevka	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Fair	Fair	Very poor.	Very poor.	Fair	Very poor.
NCA---------- Nevka	Poor	Fair	Fair	Fair	Fair	Good	Fair	Fair	Fair	Fair	Fair.
PAC, PAD, PAE, PAE2---------- Pancheri	Poor	Fair	Fair	Poor	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.	Fair.
PBF*: Pancheri----------	Very poor.	Very poor.	Fair	Poor	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.	Fair.

See footnote at end of table.

TABLE 8.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
PBF*:											
Highams Variant----	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
Rock outcrop.											
PD*:											
Pits.											
Dumps.											
RAD---------- Ramshorn	Very poor.	Very poor.	Fair	Very poor.	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.	Poor.
RBD*, RBE*:											
Ramshorn Variant---	Very poor.	Very poor.	Fair	Very poor.	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.	Poor.
Highams----------	Very poor.	Very poor.	Poor	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Poor.
RCG*:											
Rexmont----------	Very poor.	Very poor.	Poor	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Poor.
Rock outcrop.											
RD---------- Rich	Very poor.	Poor	Poor	Very poor.	Very poor.	Fair	Fair	Poor	Poor	Fair	Poor.
RE---------- Rich	Very poor.	Poor	Poor	Very poor.	Very poor.	Fair	Fair	Poor	Poor	Very poor.	Poor.
RFD---------- Richens	Very poor.	Very poor.	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.	Good.
RGF*:											
Richens----------	Very poor.	Very poor.	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.	Good.
Agassiz----------	Very poor.	Very poor.	Poor	Poor	Poor	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Poor.
RHC, RHD---------- Richville	Poor	Poor	Fair	Poor	Fair	Very poor.	Very poor.	Poor	Poor	Very poor.	Fair.
SA---------- Saleratus	Poor	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good	Fair.
SB---------- Saleratus	Very poor.	Very poor.	Poor	Poor	Poor	Fair	Fair	Very poor.	Poor	Fair	Poor.
SC*:											
Saleratus Variant--	Poor	Poor	Fair	Fair	Fair	Fair	Fair	Poor	Fair	Fair	Fair.
Canburn Variant----	Poor	Poor	Fair	Fair	Fair	Fair	Fair	Poor	Fair	Fair	Fair.
SDF---------- Sambrito	Very poor.	Very poor.	Good	Good	Fair.	Very poor.	Very poor.	Poor	Good	Very poor.	---
SEE---------- Scout	Very poor.	Very poor.	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.	Good.
SFD---------- Searla	Poor	Fair	Fair	Poor	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.	Fair.
SGF---------- Slinger	Very poor.	Very poor.	Poor	Very poor.	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.	Poor.

See footnote at end of table.

TABLE 8.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
SHF, SJF---------- Solak	Very poor.	Very poor.	Poor	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Poor.
SKF*: Solak----------	Very poor.	Very poor.	Poor	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Poor.
Ranruff----------	Very poor.	Very poor.	Poor	Very poor.	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.	Poor.
Rock outcrop.											
SLE---------- St. Marys	Very poor.	Very poor.	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.	Fair.
SME*: St. Marys----------	Very poor.	Very poor.	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.	Fair.
Yeljack----------	Very poor.	Very poor.	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.	Good.
SNF---------- Sumine	Very poor.	Very poor.	Poor	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Poor.
TAB, TAD---------- Thatcher	Poor	Fair	Fair	Fair	Fair	Poor	Very poor.	Fair	Fair	Very poor.	Fair.
TAE---------- Thatcher	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.	Fair.
TBA---------- Thatcher	Poor	Fair	Fair	Fair	Fair	Fair	Very poor.	Fair	Fair	Poor	Fair.
TBB---------- Thatcher	Poor	Fair	Fair	Fair	Fair	Poor	Very poor.	Fair	Fair	Very poor.	Fair.
TBC, TBD---------- Thatcher	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.	Fair.
VAE---------- Vanni	Poor	Fair	Fair	Fair	Fair	Poor	Very poor.	Fair	Fair	Very poor.	Fair.
VAF---------- Vanni	Very poor.	Very poor.	Fair	Fair	Fair	Poor	Very poor.	Poor	Fair	Very poor.	Fair.
VBF---------- Vanni	Very poor.	Very poor.	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.	Fair.
VCD---------- Vicking	Poor	Fair	Fair	Fair	Fair	Poor	Very poor.	Fair	Fair	Very poor.	Fair.
WA---------- Wader	Poor	Fair	Fair	Fair	Fair	Good	Fair	Fair	Fair	Fair	Fair.
WB---------- Wader	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Fair	Fair	Very poor.	Very poor.	Fair	Very poor.
WC---------- Wader Variant	Very poor.	Poor	Fair	Fair	Fair	Fair	Fair	Poor	Fair	Fair	Fair.
WDC---------- Woodpass	Poor	Fair	Fair	Poor	Fair	Poor	Very poor.	Fair	Fair	Very poor.	Fair.
YAE---------- Yeates Hollow	Very poor.	Very poor.	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.	Good.
YBD*: Yeates Hollow------	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.	Good.

See footnote at end of table.

TABLE 8.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herba-ceous plants	Conif-erous plants	Shrubs	Wetland plants	Shallow water areas	Open-land wild-life	Wood-land wild-life	Wetland wild-life	Range-land wild-life
YBD*:											
Obray	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.	Good.
YCD, YDE Yeljack	Very poor.	Very poor.	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.	Good.
YEE*:											
Yeljack	Very poor.	Very poor.	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.	Good.
Cluff	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.	Good.
ZAD*:											
Zagg	Poor	Poor	Fair	Poor	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.	Fair.
Zagg	Poor	Poor	Fair	Poor	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.	Fair.
ZBC Zegro	Poor	Poor	Fair	Poor	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.	Fair.
ZCD*:											
Zegro	Poor	Poor	Fair	Poor	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.	Fair.
Zagg	Poor	Poor	Fair	Poor	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.	Fair.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 9.--BUILDING SITE DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
AAD*, AAF*:						
Agassiz	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: large stones, slope, thin layer.
Mult	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
ABF*:						
Agassiz	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, thin layer.
Richville	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
ACF*:						
Agassiz	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, thin layer.
Rock outcrop.						
ADD Alhark	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope.
ADE Alhark	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
AEC Alhark	Slight	Slight	Slight	Moderate: slope.	Moderate: low strength, frost action.	Slight.
AFD Ant Flat	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope.	Severe: shrink-swell, slope.	Severe: low strength, slope, shrink-swell.	Severe: slope.
BAD Baird Hollow	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
BB, BC, BD Bear Lake	Severe: cutbanks cave, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: ponding, flooding, frost action.	Severe: ponding.
BEF Bequinn	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: small stones, droughty, slope.
BFB Bereniceton	Slight	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.	Slight.
BGE Bereniceton	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
BHA Bockston	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding, frost action.	Slight.

See footnote at end of table.

TABLE 9.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
BHB Bockston	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Slight.
BJC Bullnel	Moderate: depth to rock, slope.	Moderate: shrink-swell, slope.	Moderate: depth to rock, slope, shrink-swell.	Severe: slope.	Moderate: slope, frost action, shrink-swell.	Moderate: slope, thin layer.
BJE Bullnel	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
CA Canburn	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: wetness, flooding.	Severe: wetness, flooding.
CBD*: Cloud Rim	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope.
McCarey	Severe: depth to rock.	Moderate: shrink-swell, slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Severe: low strength.	Moderate: slope, thin layer.
CCE Cluff	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
CDD, CDE Condie	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
CEA Cowco	Slight	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength.	Slight.
CEB Cowco	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate shrink-swell.	Severe: low strength.	Slight.
CFA Cowco	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Severe: excess sodium.
CGD, CGF Cutoff	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope.
CHF*: Cutoff	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope.
Falula	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: small stones, thin layer.
DAF Dagan	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
DBF Dagan	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: small stones, slope.
DCF Dagan	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
DDF*: Dagan	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: small stones, slope.

See footnote at end of table.

TABLE 9.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
DDF*: Rubble Land.						
DEE---- Dennot	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
DFC---- Dennot	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Severe: small stones.
DGF---- Despain	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
DHB---- Despain Variant	Slight----	Slight----	Slight----	Slight----	Moderate: frost action.	Moderate: small stones.
DJA---- Duckree	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.	Moderate: droughty.
DKD, DLE---- Duckree	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: small stones.
DMF*: Duckree----	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, small stones.
St. Marys----	Severe: large stones, slope.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope.
EAC---- Ellett	Severe: depth to rock.	Moderate: depth to rock.	Severe: depth to rock.	Moderate: slope, depth to rock.	Moderate: depth to rock, frost action.	Severe: thin layer.
EAE---- Ellett	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope, thin layer.
EBD---- Ercan	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: slope, frost action, shrink-swell.	Moderate: slope.
EBE---- Ercan	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
ECE---- Etchen	Severe: depth to rock, large stones, slope.	Severe: slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: small stones, large stones, slope.
FAE---- Falula	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: small stones, thin layer.
FBC---- Falula	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: thin layer.
FCE*: Falula----	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: thin layer.
Kearl----	Severe: depth to rock.	Moderate: slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Moderate: depth to rock, slope, frost action.	Moderate: slope, thin layer.

See footnote at end of table.

TABLE 9.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
FDF---------- Flygare	Severe: large stones, slope.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: large stones, slope.
FEE*:						
Fontreen----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Rexmont----------	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: thin layer.
FFF, FGE---------- Foxol	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, slope.	Severe: small stones, large stones, thin layer.
GAD---------- Gobine	Slight---------	Slight---------	Slight---------	Moderate: slope.	Moderate: frost action.	Slight.
GBE*:						
Gridge----------	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, thin layer.
Rock outcrop.						
GCE---------- Guilder	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
HAB---------- Hades	Slight---------	Slight---------	Moderate: shrink-swell.	Moderate: slope.	Moderate: frost action.	Slight.
HBD---------- Hawkins	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, slope, shrink-swell.	Severe: slope.
HC---------- Hival	Severe: wetness.	Severe: flooding, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, shrink-swell.	Severe: low strength, frost action, shrink-swell.	Moderate: wetness.
HDC---------- Horrocks	Severe: large stones.	Severe: large stones.	Severe: large stones.	Severe: slope, large stones.	Severe: large stones.	Moderate: large stones, slope.
HEF---------- Hourglass	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
JAE, JAF---------- Jebo	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: small stones, slope.
KAF---------- Kamack	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
KBD---------- Kearl	Severe: depth to rock.	Moderate: slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Moderate: depth to rock, slope, frost action.	Moderate: slope, thin layer.
KBE, KBF---------- Kearl	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope.

See footnote at end of table.

TABLE 9.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
KCD*:						
Kearl	Severe: depth to rock.	Moderate: slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Moderate: depth to rock, slope, frost action.	Moderate: droughty, slope, thin layer.
Richville	Moderate: depth to rock.	Moderate: shrink-swell.	Moderate: depth to rock, shrink-swell.	Moderate: shrink-swell, slope.	Moderate: frost action, shrink-swell.	Moderate: thin layer.
LAD	Severe: cemented pan.	Moderate: cemented pan.	Severe: cemented pan.	Moderate: slope, cemented pan.	Moderate: cemented pan, frost action.	Moderate: thin layer.
LBC	Severe: depth to rock.	Moderate: depth to rock.	Severe: depth to rock.	Moderate: slope, depth to rock.	Moderate: depth to rock.	Moderate: droughty, thin layer.
LCD	Severe: depth to rock.	Moderate: depth to rock.	Severe: depth to rock.	Moderate: slope, depth to rock.	Moderate: depth to rock, frost action.	Moderate: thin layer.
LCE	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope.
LDD, LDF	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
LEF*:						
Lucky Star	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Condie	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
LFF*:						
Lundy	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: small stones, slope, thin layer.
Rock outcrop.						
MAA	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding, frost action.	Moderate: droughty.
MBE*:						
Mirror Lake	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: droughty, slope.
Sambrito	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
MCD*:						
Mult	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
Agassiz	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: large stones, slope, thin layer.

See footnote at end of table.

TABLE 9.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
MDC*:						
Murphy	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
Richville	Moderate: depth to rock.	Moderate: shrink-swell.	Moderate: depth to rock, shrink-swell.	Moderate: shrink-swell, slope.	Moderate: frost action, shrink-swell.	Moderate: thin layer.
MDE*:						
Murphy	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
Richville	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
NAD	Moderate: depth to rock, slope.	Moderate: slope.	Moderate: depth to rock, slope.	Severe: slope.	Moderate: slope.	Moderate: slope, thin layer.
Neponset						
NBA	Severe: cutbanks cave, wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: frost action.	Severe: excess salt, excess sodium.
Nevka						
NCA	Severe: cutbanks cave, wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: frost action.	Moderate: wetness.
Nevka						
PAC	Slight	Slight	Slight	Slight	Moderate: frost action.	Slight.
Pancheri						
PAD	Slight	Slight	Slight	Moderate: slope.	Moderate: frost action.	Slight.
Pancheri						
PAE, PAE2	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Pancheri						
PBF*:						
Pancheri	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Highams Variant	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, thin layer.
Rock outcrop.						
PD*:						
Pits.						
Dumps.						
RAD	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Severe: excess sodium.
Ramshorn						
RBD*:						
Ramshorn Variant	Severe: depth to rock.	Moderate: slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Moderate: depth to rock, slope, frost action.	Moderate: small stones, droughty, slope.
Highams	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: thin layer.

See footnote at end of table.

TABLE 9.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
RBE*:						
Ramshorn Variant-	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope.
Highams	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, thin layer.
RCG*:						
Rexmont	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, thin layer.
Rock outcrop.						
RD	Severe: wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: frost action.	Severe: excess sodium.
Rich						
RE	Moderate: wetness.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding, frost action.	Slight.
Rich						
RFD	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, slope, shrink-swell.	Severe: slope.
Richens						
RGF*:						
Richens	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, slope, shrink-swell.	Severe: slope.
Agassiz	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: large stones, slope, thin layer.
RHC	Moderate: depth to rock.	Moderate: shrink-swell.	Moderate: depth to rock, shrink-swell.	Moderate: shrink-swell, slope.	Moderate: frost action, shrink-swell.	Moderate: thin layer.
Richville						
RHD	Moderate: depth to rock, slope.	Moderate: shrink-swell, slope.	Moderate: depth to rock, slope, shrink-swell.	Severe: slope.	Moderate: slope, frost action, shrink-swell.	Moderate: slope, thin layer.
Richville						
SA	Severe: wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: low strength, frost action.	Moderate: wetness.
Saleratus						
SB	Severe: wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: low strength, frost action.	Severe: excess sodium.
Saleratus						
SC*:						
Saleratus Variant	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Moderate: wetness, frost action.	Moderate: wetness, droughty.
Canburn Variant--	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: wetness, flooding.	Severe: wetness.
SDF	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Sambrito						

See footnote at end of table.

TABLE 9.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
SEE---------- Scout	Severe: large stones, slope.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: small stones, large stones.
SFD---------- Searla	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: small stones, slope.
SGF---------- Slinger	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope.
SHF, SJF---------- Solak	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, thin layer.
SKF*: Solak----------	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: small stones, slope, thin layer.
Ranruff----------	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, thin layer.
Rock outcrop.						
SLE---------- St. Marys	Severe: large stones, slope.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope.
SME*: St. Marys--------	Severe: large stones, slope.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope.
Yeljack----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
SNF---------- Sumine	Severe: depth to rock, large stones, slope.	Severe: slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope.
TAB---------- Thatcher	Slight---------	Slight---------	Slight---------	Slight---------	Severe: low strength, frost action.	Slight.
TAD---------- Thatcher	Slight---------	Slight---------	Slight---------	Moderate: slope.	Severe: low strength, frost action.	Slight.
TAE---------- Thatcher	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope, frost action.	Severe: slope.
TBA---------- Thatcher	Slight---------	Slight---------	Slight---------	Slight---------	Severe: low strength, frost action.	Slight.
TBB---------- Thatcher	Slight---------	Slight---------	Slight---------	Moderate: slope.	Severe: low strength, frost action.	Slight.

See footnote at end of table.

TABLE 9.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
TBC---------- Thatcher	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
TBD---------- Thatcher	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope, frost action.	Severe: slope.
VAE, VAF---------- Vanni	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
VBF---------- Vanni	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: large stones, slope.
VCD---------- Vicking	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope.
WA, WB---------- Wader	Severe: cutbanks cave, wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: flooding, frost action.	
WC---------- Wader Variant	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: frost action.	Severe: droughty.
WDC---------- Woodpass	Slight---------	Slight---------	Slight---------	Slight---------	Moderate: low strength.	Slight.
YAE---------- Yeates Hollow	Severe: large stones, slope.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Moderate: small stones, droughty.
YBD*: Yeates Hollow----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Obray----------	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, slope, shrink-swell.	Severe: slope.
YCD, YDE---------- Yeljack	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
YEE*: Yeljack----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Cluff----------	Severe: large stones, slope.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope.
ZAD*: Zagg----------	Moderate: too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell.	Moderate: small stones, slope.
Zagg----------	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Slight.
ZBC---------- Zegro	Moderate: depth to rock, too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Moderate: thin layer.

See footnote at end of table.

TABLE 9.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
ZCD*:						
Zegro	Moderate: depth to rock, too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell.	Moderate: slope, thin layer.
Zagg	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Slight.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 10.--SANITARY FACILITIES

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
AAD*, AAF*: Agassiz	Severe: depth to rock, slope.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope.	Poor: area reclaim, small stones, slope.
Mult	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, slope.
ABF*: Agassiz	Severe: depth to rock, slope.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope.	Poor: area reclaim, small stones, slope.
Richville	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, slope.
ACF*: Agassiz	Severe: depth to rock, slope.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope.	Poor: area reclaim, small stones, slope.
Rock outcrop.					
ADD---- Alhark	Moderate: depth to rock, slope.	Severe: seepage, slope.	Severe: depth to rock, seepage.	Severe: seepage.	Fair: area reclaim, small stones, slope.
ADE---- Alhark	Severe: slope.	Severe: seepage, slope.	Severe: depth to rock, seepage, slope.	Severe: seepage, slope.	Poor: slope.
AEC---- Alhark	Moderate: percs slowly.	Severe: slope.	Slight----	Slight----	Good.
AFD---- Ant Flat	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope, thin layer.
BAD---- Baird Hollow	Severe: percs slowly, slope.	Severe: slope, large stones.	Severe: slope, too clayey, large stones.	Severe: slope.	Poor: too clayey, large stones, slope.
BB, BC, BD---- Bear Lake	Severe: flooding, ponding, percs slowly.	Severe: seepage, ponding.	Severe: flooding, seepage, ponding.	Severe: flooding, ponding.	Poor: ponding.
BEF---- Bequinn	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, small stones.

See footnote at end of table.

TABLE 10.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
BFB Bereniceton	Severe: percs slowly.	Moderate: slope.	Moderate: flooding.	Moderate: flooding.	Good.
BGE Bereniceton	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
BHA, BHB Bockston	Severe: poor filter.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: small stones.
BJC Bullnel	Severe: depth to rock, percs slowly.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim, small stones.
BJE Bullnel	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, small stones, slope.
CA Canburn	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
CBD*: Cloud Rim	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, small stones, slope.
McCarey	Severe: depth to rock.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage.	Severe: depth to rock, seepage.	Poor: area reclaim.
CCE Cluff	Severe: percs slowly, slope.	Severe: slope.	Severe: depth to rock, slope, too clayey.	Severe: slope.	Poor: too clayey, small stones, slope.
CDD, CDE Condie	Severe: percs slowly, slope.	Severe: seepage, slope.	Severe: slope.	Severe: slope.	Poor: small stones, slope.
CEA Cowco	Severe: percs slowly.	Slight	Moderate: flooding, too clayey.	Moderate: flooding.	Fair: too clayey.
CEB Cowco	Severe: percs slowly.	Moderate	Moderate: too clayey.	Slight	Fair: too clayey.
CFA Cowco	Severe: percs slowly.	Slight	Severe: excess sodium.	Slight	Poor: excess sodium.
CGD, CGF Cutoff	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: area reclaim, small stones, slope.
CHF*: Cutoff	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: area reclaim, small stones, slope.
Falula	Severe: depth to rock.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, large stones.	Severe: depth to rock.	Poor: area reclaim, small stones.

See footnote at end of table.

TABLE 10.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
DAF---------- Dagan	Severe: slope.	Severe: seepage, slope.	Severe: depth to rock, seepage, slope.	Severe: seepage, slope.	Poor: seepage, small stones, slope.
DBF---------- Dagan	Severe: slope.	Severe: seepage, slope, large stones.	Severe: depth to rock, seepage, slope.	Severe: seepage, slope.	Poor: seepage, small stones, slope.
DCF---------- Dagan	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope, large stones.	Severe: seepage, slope.	Poor: small stones, slope.
DDF*: Dagan----------	Severe: slope.	Severe: seepage, slope, large stones.	Severe: depth to rock, seepage, slope.	Severe: seepage, slope.	Poor: seepage, small stones, slope.
Rubble Land.					
DEE---------- Dennot	Severe: slope.	Severe: seepage, slope.	Severe: depth to rock, seepage, slope.	Severe: seepage, slope.	Poor: small stones, slope.
DFC---------- Dennot	Moderate: percs slowly, slope.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Poor: small stones.
DGF---------- Despain	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: small stones, slope.
DHB---------- Despain Variant	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: large stones.	Slight----------	Poor: small stones.
DJA---------- Duckree	Severe: poor filter.	Severe: seepage.	Slight----------	Slight----------	Poor: small stones.
DKD, DLE---------- Duckree	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: slope.	Severe: slope.	Poor: small stones, slope.
DMF*: Duckree----------	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: slope.	Severe: slope.	Poor: small stones, slope.
St. Marys----------	Severe: slope, large stones.	Severe: seepage, slope, large stones.	Severe: depth to rock, seepage, slope.	Severe: seepage, slope.	Poor: large stones, slope.
EAC---------- Ellett	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim.
EAE---------- Ellett	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, slope.
EBD---------- Ercan	Severe: percs slowly.	Severe: slope.	Severe: depth to rock.	Moderate: depth to rock, slope.	Fair: area reclaim, too clayey, slope.

See footnote at end of table.

TABLE 10.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
EBE Ercan	Severe: percs slowly, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: slope.
ECE Etchen	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope.	Poor: area reclaim, large stones, slope.
FAE Falula	Severe: depth to rock.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, large stones.	Severe: depth to rock.	Poor: area reclaim, small stones.
FBC Falula	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim, small stones.
FCE*: Falula	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim, small stones.
Kearl	Severe: depth to rock.	Severe: seepage, depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock, seepage.	Poor: area reclaim.
FDF Flygare	Severe: slope, large stones.	Severe: seepage, slope, large stones.	Severe: seepage, slope, large stones.	Severe: slope.	Poor: large stones, slope.
FEE*: Fontreen	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: small stones, slope.
Rexmont	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim, small stones.
FFF, FGE Foxol	Severe: depth to rock, slope.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope.	Poor: area reclaim, small stones, slope.
GAD Gobine	Severe: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Good.
GBE*: Gridge	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, slope.
Rock outcrop.					
GCE Guilder	Severe: percs slowly, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: slope, thin layer.
HAB Hades	Severe: percs slowly.	Moderate: seepage, depth to rock, slope.	Severe: depth to rock.	Moderate: depth to rock.	Fair: area reclaim, too clayey.

See footnote at end of table.

TABLE 10.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
HBD---------- Hawkins	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: hard to pack, slope.
HC---------- Hival	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack.
HDC---------- Horrocks	Severe: large stones.	Severe: seepage, slope, large stones.	Severe: depth to rock, seepage.	Severe: seepage.	Poor: large stones.
HEF---------- Hourglass	Severe: percs slowly, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: small stones, slope.
JAE, JAF---------- Jebo	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: area reclaim, small stones, slope.
KAF---------- Kamack	Severe: slope.	Severe: seepage, slope.	Severe: depth to rock, seepage, slope.	Severe: seepage, slope.	Poor: small stones, slope.
KBD---------- Kearl	Severe: depth to rock.	Severe: seepage, depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock, seepage.	Poor: area reclaim.
KBE, KBF---------- Kearl	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, seepage, slope.	Poor: area reclaim, slope.
KCD*: Kearl----------	Severe: depth to rock.	Severe: seepage, depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock, seepage.	Poor: area reclaim.
Richville----------	Severe: depth to rock, percs slowly.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim.
LAD---------- Lakridge	Severe: cemented pan.	Severe: cemented pan, slope.	Severe: cemented pan.	Severe: cemented pan.	Poor: area reclaim.
LBC---------- Lariat	Severe: depth to rock.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage.	Severe: depth to rock, seepage.	Poor: area reclaim.
LCD---------- Lonjon	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim, small stones.
LCE---------- Lonjon	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, small stones, slope.
LDD, LDF---------- Lucky Star	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: large stones, slope.

See footnote at end of table.

TABLE 10.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
LEF*:					
Lucky Star	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: large stones, slope.
Condie	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: large stones, slope.
LFF*:					
Lundy	Severe: depth to rock, slope.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope.	Poor: area reclaim, small stones, slope.
Rock outcrop.					
MAA Matheson	Severe: wetness, poor filter.	Severe: seepage.	Severe: wetness.	Severe: wetness.	Poor: thin layer.
MBE*:					
Mirror Lake	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, large stones.	Severe: seepage, slope.	Poor: seepage, large stones, slope.
Sambrito	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: small stones, slope.
MCD*:					
Mult	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, slope.
Agassiz	Severe: depth to rock, slope.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope.	Poor: area reclaim, small stones, slope.
MDC*:					
Murphy	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey.
Richville	Severe: depth to rock, percs slowly.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim.
MDE*:					
Murphy	Severe: percs slowly, slope.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: too clayey, slope.
Richville	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, slope.
NAD Neponset	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim.
NBA Nevka	Severe: wetness, poor filter.	Severe: seepage, flooding, wetness.	Severe: wetness.	Severe: wetness.	Poor: thin layer.

See footnote at end of table.

TABLE 10.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
NCA---------- Nevka	Severe: wetness, poor filter.	Severe: seepage, flooding, wetness.	Severe: wetness, too sandy.	Severe: wetness.	Poor: seepage, too sandy.
PAC---------- Pancheri	Moderate: percs slowly.	Moderate: seepage, slope.	Slight----------	Slight----------	Good.
PAD---------- Pancheri	Moderate: percs slowly.	Severe: slope.	Slight----------	Slight----------	Good.
PAE, PAE2---------- Pancheri	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
PBF*: Pancheri----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Highams Variant----	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, slope.
Rock outcrop.					
PD*: Pits.					
Dumps.					
RAD---------- Ramshorn	Moderate: slope.	Severe: seepage, slope.	Moderate: slope.	Moderate: slope.	Poor: small stones.
RBD*: Ramshorn Variant---	Severe: depth to rock.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage.	Severe: depth to rock, seepage.	Poor: area reclaim, small stones.
Highams----------	Severe: depth to rock.	Severe: seepage, depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim, small stones.
RBE*: Ramshorn Variant---	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: area reclaim, small stones, slope.
Highams----------	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, small stones, slope.
RCG*: Rexmont----------	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, small stones, slope.
Rock outcrop.					
RD---------- Rich	Severe: wetness.	Severe: flooding, wetness.	Severe: wetness, excess sodium.	Severe: wetness.	Poor: excess sodium.

See footnote at end of table.

TABLE 10.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
RE Rich	Severe: wetness.	Severe: seepage, flooding.	Severe: seepage, wetness.	Severe: seepage.	Good.
RFD Richens	Severe: percs slowly, slope.	Severe: slope.	Severe: depth to rock, slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, slope.
RGF*: Richens	Severe: percs slowly, slope.	Severe: slope.	Severe: depth to rock, slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, slope.
Agassiz	Severe: depth to rock, slope.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope.	Poor: area reclaim, small stones, slope.
RHC Richville	Severe: depth to rock, percs slowly.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim.
RHD Richville	Severe: depth to rock, percs slowly.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim.
SA Saleratus	Severe: wetness, percs slowly.	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
SB Saleratus	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, excess sodium.	Severe: wetness.	Poor: excess sodium.
SC*: Saleratus Variant	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
Canburn Variant	Severe: flooding, wetness, poor filter.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: wetness.
SDF Sambrito	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: small stones, slope.
SEE Scout	Severe: slope, large stones.	Severe: seepage, slope, large stones.	Severe: seepage, slope, large stones.	Severe: seepage, slope.	Poor: large stones, slope.
SFD Searla	Severe: slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: small stones, slope.
SGF Slinger	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: area reclaim, small stones, slope.

See footnote at end of table.

TABLE 10.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
SHF, SJF---------- Solak	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, small stones, slope.
SKF*: Solak---------- Ranruff---------- Rock outcrop.	Severe: depth to rock, slope. Severe: depth to rock, slope.	Severe: depth to rock, slope, large stones. Severe: depth to rock, slope.	Severe: depth to rock, slope, large stones. Severe: depth to rock, slope.	Severe: depth to rock, slope. Severe: depth to rock, slope.	Poor: area reclaim, small stones, slope. Poor: area reclaim, small stones, slope.
SLE---------- St. Marys	Severe: slope, large stones.	Severe: seepage, slope, large stones.	Severe: depth to rock, seepage, slope.	Severe: seepage, slope.	Poor: large stones, slope.
SME*: St. Marys---------- Yeljack----------	Severe: slope, large stones. Severe: percs slowly, slope.	Severe: seepage, slope, large stones. Severe: slope.	Severe: depth to rock, seepage, slope. Severe: slope.	Severe: seepage, slope. Severe: slope.	Poor: large stones, slope. Poor: slope.
SNF---------- Sumine	Severe: depth to rock, slope, large stones.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: area reclaim, large stones, slope.
TAB---------- Thatcher	Severe: percs slowly.	Moderate: seepage, slope.	Slight----------	Slight----------	Good.
TAD---------- Thatcher	Severe: percs slowly.	Severe: slope.	Slight----------	Slight----------	Good.
TAE---------- Thatcher	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
TBA, TBB---------- Thatcher	Severe: percs slowly.	Moderate: seepage, slope.	Slight----------	Slight----------	Good.
TBC---------- Thatcher	Severe: percs slowly.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
TBD---------- Thatcher	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
VAE, VAF, VBF------- Vanni	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
VCD---------- Vicking	Severe: percs slowly.	Severe: slope.	Moderate: slope.	Moderate: slope.	Poor: small stones.

See footnote at end of table.

TABLE 10.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
WA---------- Wader	Severe: flooding, wetness, poor filter.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: seepage, too sandy.
WB---------- Wader	Severe: flooding, wetness, poor filter.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, wetness.	Poor: excess sodium.
WC---------- Wader Variant	Severe: wetness, poor filter.	Severe: seepage, flooding, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: seepage, small stones, wetness.
WDC---------- Woodpass	Severe: percs slowly.	Moderate: slope.	Slight----------	Slight----------	Fair: too clayey, small stones.
YAE---------- Yeates Hollow	Severe: percs slowly, slope, large stones.	Severe: slope, large stones.	Severe: depth to rock, slope, too clayey.	Severe: slope.	Poor: too clayey, large stones, slope.
YBD*: Yeates Hollow------	Severe: percs slowly, slope.	Severe: seepage, slope.	Severe: seepage, slope, too clayey.	Severe: slope.	Poor: too clayey, small stones, slope.
Obray----------	Severe: percs slowly, slope.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, slope.
YCD, YDE---------- Yeljack	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
YEE*: Yeljack----------	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Cluff----------	Severe: percs slowly, slope, large stones.	Severe: slope, large stones.	Severe: depth to rock, slope, too clayey.	Severe: slope.	Poor: too clayey, small stones, slope.
ZAD*: Zagg----------	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey.
Zagg----------	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight----------	Poor: too clayey.
ZBC---------- Zegro	Severe: depth to rock, percs slowly.	Severe: depth to rock.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: area reclaim, too clayey.
ZCD*: Zegro----------	Severe: depth to rock, percs slowly.	Severe: depth to rock, slope.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: area reclaim, too clayey.
Zagg----------	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight----------	Poor: too clayey.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 11.--CONSTRUCTION MATERIALS

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," "poor," "probable," and "improbable." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
AAD*:				
Agassiz	Poor: area reclaim, large stones.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: area reclaim, small stones, slope.
Mult	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
AAF*:				
Agassiz	Poor: area reclaim, large stones, slope.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: area reclaim, small stones, slope.
Mult	Poor: area reclaim, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
ABF*:				
Agassiz	Poor: area reclaim, slope.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: area reclaim, small stones, slope.
Richville	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
ACF*:				
Agassiz	Poor: area reclaim, slope.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: area reclaim, small stones, slope.
Rock outcrop.				
ADD Alhark	Fair: area reclaim, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
ADE Alhark	Fair: area reclaim, thin layer, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
AEC Alhark	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
AFD Ant Flat	Poor: thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
BAD Baird Hollow	Poor: low strength.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: large stones, area reclaim, slope.
BB, BC, BD Bear Lake	Poor: wetness.	Probable	Probable	Poor: wetness.

See footnote at end of table.

TABLE 11.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
BEF---------- Bequinn	Poor: slope.	Improbable: small stones.	Probable----------	Poor: small stones, area reclaim, slope.
BFB---------- Bereniceton	Good----------	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
BGE---------- Bereniceton	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
BHA, BHB---------- Bockston	Good----------	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim.
BJC---------- Bullnel	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
BJE---------- Bullnel	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
CA---------- Canburn	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
CBD*: Cloud Rim----------	Good----------	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
McCarey----------	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, small stones, thin layer.
CCE---------- Cluff	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
CDD, CDE---------- Condie	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
CEA, CEB---------- Cowco	Fair: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Good.
CFA---------- Cowco	Fair: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess sodium.
CGD---------- Cutoff	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
CGF---------- Cutoff	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
CHF*: Cutoff----------	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.

See footnote at end of table.

TABLE 11.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
CHF*:				
Falula	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones.
DAF Dagan	Poor: slope.	Improbable: small stones.	Probable	Poor: small stones, area reclaim, slope.
DBF Dagan	Poor: slope.	Improbable: small stones, large stones.	Improbable: large stones.	Poor: small stones, area reclaim, slope.
DCF Dagan	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
DDF*:				
Dagan	Poor: slope.	Improbable: small stones, large stones.	Improbable: large stones.	Poor: small stones, area reclaim, slope.
Rubble Land.				
DEE Dennot	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
DFC Dennot	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
DGF Despain	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
DHB Despain Variant	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
DJA Duckree	Good	Probable	Probable	Poor: small stones, area reclaim.
DKD, DLE Duckree	Poor: slope.	Probable	Probable	Poor: small stones, area reclaim.
DMF*:				
Duckree	Poor: slope.	Probable	Probable	Poor: small stones, area reclaim.
St. Marys	Poor: large stones, slope.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: large stones, area reclaim, slope.
EAC Ellett	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones.

See footnote at end of table.

TABLE 11.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
EAE---------- Ellett	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, slope.
EBD---------- Ercan	Fair: area reclaim, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
EBE---------- Ercan	Fair: area reclaim, thin layer, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
ECE---------- Etchen	Poor: area reclaim, large stones, slope.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: large stones, slope.
FAE, FBC---------- Falula	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones.
FCE*: Falula----------	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones.
Kearl----------	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, small stones, slope.
FDF---------- Flygare	Poor: large stones, slope.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: small stones, area reclaim, slope.
FEE*: Fontreen----------	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
Rexmont----------	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones.
FFF, FGE---------- Foxol	Poor: area reclaim.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: area reclaim, small stones, slope.
GAD---------- Gobine	Good----------	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
GBE*: Gridge----------	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, slope.
Rock outcrop.				
GCE---------- Guilder	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, slope.

See footnote at end of table.

TABLE 11.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
HAB---------- Hades	Fair: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
HBD---------- Hawkins	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
HC---------- Hival	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
HDC---------- Horrocks	Poor: large stones.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: large stones, area reclaim.
HEF---------- Hourglass	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, slope.
JAE---------- Jebo	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
JAF---------- Jebo	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
KAF---------- Kamack	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
KBD---------- Kearl	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, small stones, slope.
KBE---------- Kearl	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
KBF---------- Kearl	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
KCD*: Kearl----------	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, small stones, slope.
Richville----------	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
LAD---------- Lakridge	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, small stones, thin layer.
LBC---------- Lariat	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
LCD---------- Lonjon	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
LCE---------- Lonjon	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.

See footnote at end of table.

TABLE 11.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
LDD---------- Lucky Star	Fair: large stones, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
LDF---------- Lucky Star	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
LEF*: Lucky Star----------	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
Condie----------	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
LFF*: Lundy----------	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, slope.
Rock outcrop.				
MAA---------- Matheson	Good----------	Probable----------	Improbable: too sandy.	Fair: thin layer.
MBE*: Mirror Lake----------	Fair: large stones, slope.	Improbable: large stones.	Improbable: large stones.	Poor: area reclaim, small stones, slope.
Sambrito----------	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
MCD*: Mult----------	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Agassiz----------	Poor: area reclaim, large stones.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: area reclaim, small stones, slope.
MDC*: Murphy----------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Richville----------	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
MDE*: Murphy----------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, slope.
Richville----------	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.

See footnote at end of table.

TABLE 11.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
NAD---------- Neponset	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
NBA---------- Nevka	Fair: wetness.	Probable----------	Improbable: too sandy.	Poor: excess salt, excess sodium.
NCA---------- Nevka	Fair: wetness.	Probable----------	Improbable: too sandy.	Fair: small stones, thin layer.
PAC, PAD---------- Pancheri	Good----------	Improbable: excess fines.	Improbable: excess fines.	Good.
PAE, PAE2---------- Pancheri	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
PBF*: Pancheri----------	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Highams Variant------	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, slope.
Rock outcrop.				
PD*: Pits.				
Dumps.				
RAD---------- Ramshorn	Good----------	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, excess sodium.
RBD*: Ramshorn Variant-----	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Highams----------	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones.
RBE*: Ramshorn Variant-----	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Highams----------	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, slope.
RCG*: Rexmont----------	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, slope.
Rock outcrop.				
RD---------- Rich	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess sodium.

See footnote at end of table.

TABLE 11.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
RE---------- Rich	Good----------	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
RFD---------- Richens	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
RGF*: Richens----------	Poor: low strength, slope, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Agassiz----------	Poor: area reclaim, large stones, slope.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: area reclaim, small stones, slope.
RHC, RHD---------- Richville	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
SA---------- Saleratus	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
SB---------- Saleratus	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess sodium.
SC*: Saleratus Variant----	Fair: wetness.	Probable----------	Probable----------	Poor: thin layer.
Canburn Variant------	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
SDF---------- Sambrito	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
SEE---------- Scout	Poor: large stones, slope.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: large stones, area reclaim, slope.
SFD---------- Searla	Fair: area reclaim, thin layer, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
SGF---------- Slinger	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
SHF, SJF---------- Solak	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, slope.
SKF*: Solak----------	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, slope.

See footnote at end of table.

TABLE 11.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
SKF*:				
Ranruff	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, slope.
Rock outcrop.				
SLE St. Marys	Poor: large stones, slope.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: large stones, area reclaim, slope.
SME*:				
St. Marys	Poor: large stones, slope.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: large stones, area reclaim, slope.
Yeljack	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, slope.
SNF Sumine	Poor: area reclaim, large stones, slope.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: large stones, slope.
TAB, TAD Thatcher	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
TAE Thatcher	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
TBA, TBB Thatcher	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
TBC Thatcher	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, slope.
TBD Thatcher	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
VAE Vanni	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
VAF Vanni	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
VBF Vanni	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
VCD Vicking	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
WA Wader	Fair: wetness.	Probable	Improbable: too sandy.	Fair: thin layer.
WB Wader	Fair: wetness.	Probable	Improbable: too sandy.	Poor: excess salt, excess sodium.
WC Wader Variant	Fair: wetness.	Probable	Probable	Poor: small stones, area reclaim.

See footnote at end of table.

TABLE 11.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
WDC---------- Woodpass	Good----------	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
YAE---------- Yeates Hollow	Poor: large stones, slope.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: large stones, area reclaim, slope.
YBD*: Yeates Hollow--------	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
Obray----------	Poor: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
YCD, YDE---------- Yeljack	Fair: slope, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, slope.
YEE*: Yeljack----------	Fair: slope, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, slope.
Cluff----------	Poor: large stones, slope.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: small stones, area reclaim, slope.
ZAD*: Zagg----------	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Zagg----------	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
ZBC---------- Zegro	Poor: area reclaim, low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
ZCD*: Zegro----------	Poor: area reclaim, low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Zagg----------	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--WATER MANAGEMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated]

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
AAD*, AAF*: Agassiz	Severe: depth to rock, slope.	Severe: piping, large stones.	Deep to water	Large stones, droughty, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
Mult	Severe: slope.	Severe: thin layer.	Deep to water	Percs slowly, depth to rock, slope.	Slope, depth to rock, percs slowly.	Slope, depth to rock, percs slowly.
ABF*: Agassiz	Severe: depth to rock, slope.	Severe: piping, large stones.	Deep to water	Large stones, droughty, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
Richville	Severe: slope.	Severe: piping.	Deep to water	Depth to rock, slope, erodes easily.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
ACF*: Agassiz	Severe: depth to rock, slope.	Severe: piping, large stones.	Deep to water	Large stones, droughty, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
Rock outcrop.						
ADD, ADE Alhark	Severe: seepage, slope.	Severe: piping.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
AEC Alhark	Moderate: seepage, slope.	Severe: piping.	Deep to water	Slope, erodes easily.	Erodes easily	Erodes easily.
AFD Ant Flat	Severe: slope.	Moderate: piping.	Deep to water	Percs slowly, slope.	Slope, erodes easily, percs slowly.	Slope, erodes easily, percs slowly.
BAD Baird Hollow	Severe: slope.	Severe: large stones.	Deep to water	Large stones, percs slowly, slope.	Slope, large stones, percs slowly.	Large stones, slope, percs slowly.
BB, BC Bear Lake	Moderate: seepage.	Severe: piping, ponding.	Ponding, percs slowly, flooding.	Ponding, percs slowly.	Ponding, percs slowly.	Wetness, excess salt.
BD Bear Lake	Moderate: seepage.	Severe: piping, ponding.	Ponding, percs slowly, flooding.	Ponding, percs slowly, erodes easily.	Erodes easily, ponding, percs slowly.	Wetness, excess salt, erodes easily.
BEF Bequinn	Severe: seepage, slope.	Severe: seepage.	Deep to water	Droughty, slope.	Slope, large stones, too sandy.	Large stones, slope, droughty.
BFB Bereniceton	Slight	Severe: piping.	Deep to water	Erodes easily	Erodes easily	Erodes easily.
BGE Bereniceton	Severe: slope.	Severe: piping.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
BHA Bockston	Severe: seepage.	Severe: seepage.	Deep to water	Favorable	Erodes easily	Erodes easily.
BHB Bockston	Severe: seepage.	Severe: seepage.	Deep to water	Slope	Erodes easily	Erodes easily.

See footnote at end of table.

TABLE 12.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
BJC, BJE---------- Bullnel	Severe: slope.	Severe: piping.	Deep to water	Depth to rock, slope.	Slope, depth to rock.	Slope, erodes easily.
CA---------- Canburn	Slight----------	Severe: piping, wetness.	Flooding, frost action.	Wetness, flooding.	Wetness---------	Wetness.
CBD*: Cloud Rim---------	Severe: slope.	Moderate: thin layer, piping.	Deep to water	Slope----------	Slope, large stones, erodes easily.	Slope, erodes easily.
McCarey----------	Severe: seepage, slope.	Severe: thin layer.	Deep to water	Depth to rock, slope.	Slope, depth to rock.	Slope, depth to rock.
CCE---------- Cluff	Severe: slope.	Severe: large stones.	Deep to water	Large stones, droughty, percs slowly.	Slope, large stones, percs slowly.	Large stones, slope, droughty.
CDD, CDE---------- Condie	Severe: slope.	Severe: seepage.	Deep to water	Droughty, slope.	Slope, large stones.	Large stones, slope, droughty.
CEA---------- Cowco	Slight----------	Severe: piping.	Deep to water	Percs slowly, erodes easily.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
CEB---------- Cowco	Moderate: slope.	Severe: piping.	Deep to water	Percs slowly, slope, erodes easily.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
CFA---------- Cowco	Slight----------	Severe: piping, excess sodium.	Deep to water	Percs slowly, erodes easily.	Erodes easily, percs slowly.	Excess salt, excess sodium, erodes easily.
CGD, CGF---------- Cutoff	Severe: seepage, slope.	Severe: large stones.	Deep to water	Large stones, droughty, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
CHF*: Cutoff----------	Severe: seepage, slope.	Severe: large stones.	Deep to water	Large stones, droughty, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
Falula----------	Severe: depth to rock, slope.	Severe: large stones.	Deep to water	Large stones, depth to rock, slope.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
DAF---------- Dagan	Severe: seepage, slope.	Severe: seepage.	Deep to water	Large stones, droughty, slope.	Slope, large stones.	Large stones, slope, droughty.
DBF---------- Dagan	Severe: seepage, slope.	Severe: seepage, large stones.	Deep to water	Large stones, droughty, slope.	Slope, large stones.	Large stones, slope, droughty.
DCF---------- Dagan	Severe: seepage, slope.	Severe: seepage.	Deep to water	Large stones, droughty, slope.	Slope, large stones.	Large stones, slope, droughty.
DDF*: Dagan----------	Severe: seepage, slope.	Severe: seepage, large stones.	Deep to water	Large stones, droughty, slope.	Slope, large stones.	Large stones, slope, droughty.
Rubble land.						
DEE---------- Dennot	Severe: seepage, slope.	Moderate: thin layer.	Deep to water	Droughty, slope.	Slope, large stones.	Slope, droughty.

See footnote at end of table.

TABLE 12.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
DFC---------- Dennot	Severe: seepage, slope.	Moderate: thin layer, large stones.	Deep to water	Droughty, slope.	Slope, large stones.	Large stones, slope, droughty.
DGF---------- Despain	Severe: slope.	Severe: piping.	Deep to water	Slope----------	Slope, large stones.	Large stones, slope.
DHB---------- Despain Variant	Moderate: seepage.	Slight---------	Deep to water	Favorable------	Large stones---	Favorable.
DJA---------- Duckree	Severe: seepage.	Severe: seepage.	Deep to water	Droughty-------	Favorable------	Droughty.
DKD, DLE---------- Duckree	Severe: seepage, slope.	Severe: seepage.	Deep to water	Droughty, slope.	Slope, large stones.	Slope, droughty.
DMF*: Duckree----------	Severe: seepage, slope.	Severe: seepage.	Deep to water	Droughty, slope.	Slope, large stones.	Slope, droughty.
St. Marys--------	Severe: seepage, slope.	Severe: large stones.	Deep to water	Large stones, droughty, slope.	Slope, large stones.	Large stones, slope, droughty.
EAC---------- Ellett	Severe: depth to rock.	Severe: piping.	Deep to water	Depth to rock, slope, erodes easily.	Depth to rock	Erodes easily.
EAE---------- Ellett	Severe: depth to rock, slope.	Severe: piping.	Deep to water	Depth to rock, slope, erodes easily.	Slope, depth to rock.	Slope, erodes easily.
EBD, EBE---------- Ercan	Severe: slope.	Severe: thin layer.	Deep to water	Slope----------	Slope, erodes easily.	Slope, erodes easily.
ECE---------- Etchen	Severe: slope.	Severe: large stones.	Deep to water	Large stones, droughty, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
FAE---------- Falula	Severe: depth to rock, slope.	Severe: large stones.	Deep to water	Large stones, depth to rock, slope.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
FBC---------- Falula	Severe: depth to rock.	Moderate: large stones.	Deep to water	Large stones, depth to rock, slope.	Large stones, depth to rock.	Large stones, droughty.
FCE*: Falula----------	Severe: depth to rock, slope.	Moderate: large stones.	Deep to water	Large stones, depth to rock, slope.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
Kearl----------	Severe: slope.	Severe: piping.	Deep to water	Soil blowing, depth to rock.	Slope, depth to rock, erodes easily.	Slope, erodes easily.
FDF---------- Flygare	Severe: slope.	Severe: large stones.	Deep to water	Large stones, droughty, slope.	Slope, large stones.	Large stones, slope, droughty.
FEE*: Fontreen---------	Severe: seepage, slope.	Slight---------	Deep to water	Droughty, slope.	Slope----------	Slope, droughty.
Rexmont----------	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Droughty, depth to rock, slope.	Slope, large stones, depth to rock.	Large stones, slope, droughty.

See footnote at end of table.

TABLE 12.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
FFF, FGE---------- Foxol	Severe: depth to rock, slope.	Severe: large stones.	Deep to water	Large stones, droughty, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
GAD---------- Gobine	Moderate: seepage, slope.	Severe: piping.	Deep to water	Percs slowly, slope, erodes easily.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
GBE*: Gridge----------	Severe: depth to rock, slope.	Severe: piping.	Deep to water	Depth to rock, slope.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
Rock outcrop.						
GCE---------- Guilder	Severe: slope.	Moderate: thin layer, piping.	Deep to water	Percs slowly, slope.	Slope, erodes easily.	Slope, erodes easily, percs slowly.
HAB---------- Hades	Moderate: seepage, slope.	Moderate: piping.	Deep to water	Slope----------	Erodes easily	Erodes easily.
HBD---------- Hawkins	Severe: slope.	Moderate: hard to pack.	Deep to water	Percs slowly, slope.	Slope, percs slowly.	Slope, percs slowly.
HC---------- Hival	Slight---------	Severe: wetness.	Percs slowly, frost action.	Wetness, percs slowly, erodes easily.	Erodes easily, wetness, percs slowly.	Erodes easily, percs slowly.
HDC---------- Horrocks	Severe: seepage, slope.	Severe: large stones.	Deep to water	Large stones, droughty, slope.	Slope, large stones.	Large stones, slope, droughty.
HEF---------- Hourglass	Severe: slope.	Severe: thin layer.	Deep to water	Slope----------	Slope, large stones.	Large stones, slope.
JAE, JAF---------- Jebo	Severe: seepage, slope.	Severe: seepage.	Deep to water	Droughty, depth to rock, slope.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
KAF---------- Kamack	Severe: seepage, slope.	Severe: thin layer.	Deep to water	Slope----------	Slope, large stones.	Large stones, slope, droughty.
KBD, KBE, KBF----- Kearl	Severe: slope.	Severe: piping.	Deep to water	Soil blowing, depth to rock.	Slope, depth to rock, erodes easily.	Slope, erodes easily.
KCD*: Kearl----------	Severe: slope.	Severe: piping.	Deep to water	Droughty, soil blowing, depth to rock.	Slope, depth to rock, erodes easily.	Slope, erodes easily, droughty.
Richville--------	Moderate: depth to rock, slope.	Severe: piping.	Deep to water	Depth to rock, slope, erodes easily.	Depth to rock, erodes easily.	Erodes easily, depth to rock.
LAD---------- Lakridge	Moderate: seepage, cemented pan, slope.	Severe: piping.	Deep to water	Cemented pan, slope, erodes easily.	Cemented pan, erodes easily.	Erodes easily, cemented pan.
LBC---------- Lariat	Severe: seepage.	Severe: piping.	Deep to water	Droughty, soil blowing, depth to rock.	Depth to rock, soil blowing.	Droughty, depth to rock.

See footnote at end of table.

TABLE 12.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
LCD---------- Lonjon	Moderate: seepage, depth to rock, slope.	Severe: thin layer.	Deep to water	Depth to rock, slope.	Depth to rock	Depth to rock.
LCE---------- Lonjon	Severe: slope.	Severe: thin layer.	Deep to water	Depth to rock, slope.	Slope, depth to rock.	Slope, depth to rock.
LDD, LDF---------- Lucky Star	Severe: slope.	Severe: seepage, large stones.	Deep to water	Large stones, droughty, slope.	Slope, large stones.	Large stones, slope, droughty.
LEF*: Lucky Star-------	Severe: slope.	Severe: seepage, large stones.	Deep to water	Large stones, droughty, slope.	Slope, large stones.	Large stones, slope, droughty.
Condie----------	Severe: slope.	Severe: seepage.	Deep to water	Droughty, slope.	Slope, large stones.	Large stones, slope, droughty.
LFF*: Lundy----------	Severe: depth to rock, slope.	Severe: large stones.	Deep to water	Large stones, droughty, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
Rock outcrop.						
MAA---------- Matheson	Severe: seepage.	Severe: piping.	Deep to water	Droughty, soil blowing.	Soil blowing---	Droughty.
MBE*: Mirror Lake------	Severe: seepage, slope.	Severe: seepage, large stones.	Deep to water	Large stones, droughty, slope.	Slope, large stones, too sandy.	Large stones, slope, droughty.
Sambrito---------	Severe: seepage, slope.	Severe: seepage.	Deep to water	Large stones, droughty, soil blowing.	Slope, large stones, soil blowing.	Large stones, slope, droughty.
MCD*: Mult----------	Severe: slope.	Severe: thin layer.	Deep to water	Percs slowly, depth to rock, slope.	Slope, depth to rock, percs slowly.	Slope, depth to rock, percs slowly.
Agassiz----------	Severe: depth to rock, slope.	Severe: piping, large stones.	Deep to water	Large stones, droughty, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
MDC*: Murphy----------	Moderate: slope.	Moderate: piping.	Deep to water	Percs slowly, slope.	Percs slowly---	Percs slowly.
Richville--------	Moderate: depth to rock, slope.	Severe: piping.	Deep to water	Depth to rock, slope, erodes easily.	Depth to rock, erodes easily.	Erodes easily, depth to rock.
MDE*: Murphy----------	Severe: slope.	Moderate: piping.	Deep to water	Percs slowly, slope.	Slope, percs slowly.	Slope, percs slowly.
Richville--------	Severe: slope.	Severe: piping.	Deep to water	Depth to rock, slope, erodes easily.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
NAD---------- Neponset	Severe: slope.	Severe: piping.	Deep to water	Soil blowing, depth to rock, slope.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.

See footnote at end of table.

TABLE 12.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
NBA---------- Nevka	Severe: seepage.	Severe: piping, excess sodium.	Frost action, excess salt, excess sodium.	Wetness, erodes easily, excess sodium.	Erodes easily, wetness.	Excess salt, excess sodium, erodes easily.
NCA---------- Nevka	Severe: seepage.	Severe: seepage, piping, wetness.	Frost action, cutbanks cave.	Wetness, erodes easily.	Erodes easily, wetness, too sandy.	Erodes easily.
PAC, PAD---------- Pancheri	Moderate: seepage, slope.	Severe: piping.	Deep to water	Slope, erodes easily.	Erodes easily	Erodes easily.
PAE, PAE2--------- Pancheri	Severe: slope.	Severe: piping.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
PBF*:						
Pancheri---------	Severe: slope.	Severe: piping.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
Highams Variant--	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Depth to rock, slope.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
Rock outcrop.						
PD*:						
Pits.						
Dumps.						
RAD---------- Ramshorn	Severe: seepage, slope.	Severe: seepage, excess sodium.	Deep to water	Droughty, slope, excess sodium.	Slope----------	Slope, excess sodium, droughty.
RBD*, RBE*:						
Ramshorn Variant-	Severe: seepage, slope.	Severe: seepage.	Deep to water	Droughty, depth to rock, slope.	Slope, depth to rock.	Slope, droughty, depth to rock.
Highams----------	Severe: depth to rock, slope.	Severe: seepage.	Deep to water	Droughty, depth to rock, slope.	Slope, depth to rock.	Slope, droughty, depth to rock.
RCG*:						
Rexmont----------	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Droughty, depth to rock, slope.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
Rock outcrop.						
RD---------- Rich	Moderate: seepage.	Severe: piping, excess sodium.	Percs slowly, frost action, excess sodium.	Wetness, percs slowly, excess sodium.	Erodes easily, wetness.	Excess salt, excess sodium, erodes easily.
RE---------- Rich	Severe: seepage.	Severe: piping.	Deep to water	Percs slowly, erodes easily, excess salt.	Erodes easily	Erodes easily, percs slowly.
RFD---------- Richens	Severe: slope.	Moderate: thin layer, hard to pack.	Deep to water	Percs slowly, slope.	Slope, percs slowly.	Slope, percs slowly.
RGF*:						
Richens----------	Severe: slope.	Moderate: thin layer, hard to pack.	Deep to water	Percs slowly, slope.	Slope, percs slowly.	Slope, percs slowly.

See footnote at end of table.

TABLE 12.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
RGF*:						
Agassiz	Severe: depth to rock, slope.	Severe: piping, large stones.	Deep to water	Large stones, droughty, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
RHC Richville	Moderate: depth to rock, slope.	Severe: piping.	Deep to water	Depth to rock, slope, erodes easily.	Depth to rock, erodes easily.	Erodes easily, depth to rock.
RHD Richville	Severe: slope.	Severe: piping.	Deep to water	Depth to rock, slope, erodes easily.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
SA Saleratus	Slight	Severe: piping, wetness.	Percs slowly, frost action.	Wetness, percs slowly, erodes easily.	Erodes easily, wetness, percs slowly.	Erodes easily, percs slowly.
SB Saleratus	Slight	Severe: piping, excess sodium.	Percs slowly, frost action, excess sodium.	Wetness, percs slowly, erodes easily.	Erodes easily, wetness, percs slowly.	Excess salt, excess sodium, erodes easily.
SC*:						
Saleratus Variant	Severe: seepage.	Severe: seepage, wetness.	Cutbanks cave	Wetness, droughty, fast intake.	Erodes easily, wetness, too sandy.	Wetness, erodes easily, droughty.
Canburn Variant	Severe: seepage.	Severe: seepage, piping, wetness.	Flooding, cutbanks cave.	Wetness, droughty, fast intake.	Wetness, too sandy.	Wetness, droughty.
SDF Sambrito	Severe: seepage, slope.	Severe: seepage.	Deep to water	Large stones, droughty, soil blowing.	Slope, large stones, soil blowing.	Large stones, slope, droughty.
SEE Scout	Severe: seepage, slope.	Severe: seepage, large stones.	Deep to water	Large stones, droughty, slope.	Slope, large stones.	Large stones, slope, droughty.
SFD Searla	Severe: slope.	Moderate: thin layer.	Deep to water	Droughty, slope.	Slope	Slope, droughty.
SGF Slinger	Severe: seepage, slope.	Severe: thin layer.	Deep to water	Depth to rock, slope.	Slope, large stones, depth to rock.	Large stones, slope, erodes easily.
SHF, SJF Solak	Severe: depth to rock, slope.	Moderate: large stones.	Deep to water	Large stones, droughty, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
SKF*:						
Solak	Severe: depth to rock, slope.	Severe: large stones.	Deep to water	Large stones, droughty, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
Ranruff	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Depth to rock, slope.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
Rock outcrop.						
SLE St. Marys	Severe: seepage, slope.	Severe: large stones.	Deep to water	Large stones, droughty, slope.	Slope, large stones.	Large stones, slope, droughty.
SME*:						
St. Marys	Severe: seepage, slope.	Severe: large stones.	Deep to water	Large stones, droughty, slope.	Slope, large stones.	Large stones, slope, droughty.

See footnote at end of table.

TABLE 12.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
SME*:						
Yeljack	Severe: slope.	Slight	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
SNF: Sumine	Severe: seepage, slope.	Severe: large stones.	Deep to water	Large stones, droughty, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
TAB, TAD: Thatcher	Moderate: seepage, slope.	Severe: piping.	Deep to water	Slope	Erodes easily	Erodes easily.
TAE: Thatcher	Severe: slope.	Severe: piping.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
TBA: Thatcher	Moderate: seepage.	Severe: piping.	Deep to water	Favorable	Erodes easily	Erodes easily.
TBB: Thatcher	Moderate: seepage, slope.	Severe: piping.	Deep to water	Slope	Erodes easily	Erodes easily.
TBC, TBD: Thatcher	Severe: slope.	Severe: piping.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
VAE, VAF, VBF: Vanni	Severe: slope.	Severe: piping.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
VCD: Vicking	Severe: slope.	Slight	Deep to water	Percs slowly, slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily, percs slowly.
WA: Wader	Severe: seepage.	Severe: seepage, piping, wetness.	Flooding, frost action, cutbanks cave.	Wetness, flooding.	Erodes easily, wetness, too sandy.	Erodes easily.
WB: Wader	Moderate: seepage.	Severe: piping, excess sodium.	Flooding, frost action, excess salt.	Wetness, flooding, excess sodium.	Erodes easily, wetness.	Excess salt, excess sodium, erodes easily.
WC: Wader Variant	Severe: seepage.	Severe: seepage, wetness.	Frost action, cutbanks cave.	Wetness, droughty.	Wetness, too sandy.	Wetness, droughty.
WDC: Woodpass	Moderate: slope.	Severe: piping.	Deep to water	Slope	Erodes easily	Erodes easily.
YAE: Yeates Hollow	Severe: slope.	Severe: large stones.	Deep to water	Large stones, droughty, percs slowly.	Slope, large stones, percs slowly.	Large stones, slope, droughty.
YBD*:						
Yeates Hollow	Severe: slope.	Moderate: large stones.	Deep to water	Droughty, percs slowly, slope.	Slope, large stones, percs slowly.	Large stones, slope, droughty.
Obray	Severe: slope.	Moderate: hard to pack.	Deep to water	Percs slowly, slope.	Slope, percs slowly.	Slope, percs slowly.
YCD, YDE: Yeljack	Severe: slope.	Slight	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
YEE*:						
Yeljack	Severe: slope.	Slight	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
Cluff	Severe: slope.	Severe: large stones.	Deep to water	Large stones, droughty, percs slowly.	Slope, large stones, percs slowly.	Large stones, slope, droughty.

See footnote at end of table.

TABLE 12.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
ZAD*:						
Zagg	Severe: slope.	Slight	Deep to water	Percs slowly, slope.	Slope, percs slowly.	Slope, percs slowly.
Zagg	Moderate: slope.	Slight	Deep to water	Percs slowly, slope, erodes easily.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
ZBC	Moderate: depth to rock, slope.	Moderate: thin layer.	Deep to water	Percs slowly, depth to rock, slope.	Depth to rock, erodes easily.	Erodes easily, depth to rock.
Zegro						
ZCD*:						
Zegro	Severe: slope.	Moderate: thin layer.	Deep to water	Percs slowly, depth to rock, slope.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
Zagg	Moderate: slope.	Slight	Deep to water	Percs slowly, slope, erodes easily.	Erodes easily, percs slowly.	Erodes easily, percs slowly.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 13.--ENGINEERING INDEX PROPERTIES

[The symbol > means more than. Absence of an entry indicates that data were not estimated]

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
AAD*, AAF*:											
Agassiz	0-5	Very stony loam	GM-GC, SM-SC	A-4	30-50	60-80	50-70	45-65	35-50	20-30	5-10
	5-12	Very cobbly silty clay loam, very cobbly loam, very gravelly loam.	CL, CL-ML, GC, GM-GC	A-2, A-4, A-6	20-50	55-75	45-70	40-65	30-60	20-35	5-15
	12	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Mult	0-10	Loam	CL-ML, CL	A-4, A-6	0	90-100	85-95	80-95	75-85	25-35	5-15
	10-38	Silty clay loam, clay loam, silt loam.	CL	A-6	0	90-100	85-95	80-95	75-85	30-40	10-20
	38	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
ABF*:											
Agassiz	0-6	Stony loam	CL-ML	A-4	20-30	80-95	75-90	65-75	50-70	20-30	5-10
	6-10	Very cobbly silty clay loam, very cobbly loam, extremely gravelly loam.	CL, CL-ML, GC, GM-GC	A-2, A-4, A-6	20-50	55-75	45-70	40-65	30-60	20-35	5-15
	10	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Richville	0-12	Loam	CL, CL-ML	A-4, A-6	0	80-100	75-100	70-95	50-70	20-30	5-15
	12-31	Loam, clay loam, gravelly clay loam.	CL, CL-ML	A-4, A-6	0-10	80-100	70-100	65-95	50-75	25-35	5-15
	31	Weathered bedrock	---	---	---	---	---	---	---	---	---
ACF*:											
Agassiz	0-6	Stony loam	CL-ML	A-4	20-30	80-95	75-90	65-75	50-70	20-30	5-10
	6-10	Very cobbly silty clay loam, very cobbly loam, extremely gravelly loam.	CL, CL-ML, GC, GM-GC	A-2, A-4, A-6	20-50	55-75	45-70	40-65	30-60	20-35	5-15
	10	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
ADD	0-5	Loam	ML, CL-ML	A-4	0	90-100	85-100	65-95	55-75	25-35	5-10
Alhark	5-24	Loam, gravelly loam.	CL, CL-ML, SC, SM-SC	A-4, A-6	0	75-100	70-95	65-85	45-70	25-35	5-15
	24-42	Loam, gravelly loam.	CL-ML, GM-GC, SM-SC	A-4	0	60-90	55-85	50-75	35-60	25-30	5-10
	42	Weathered bedrock	---	---	---	---	---	---	---	---	---
ADE	0-12	Loam	ML, CL-ML	A-4	0	90-100	85-100	65-95	55-75	25-35	5-10
Alhark	12-46	Loam, gravelly loam.	CL, CL-ML, SC, SM-SC	A-4, A-6	0	75-100	70-95	65-85	45-70	25-35	5-15
	46	Weathered bedrock	---	---	---	---	---	---	---	---	---
AEC	0-7	Silt loam	CL-ML	A-4	0	90-100	85-100	80-100	65-90	25-30	5-10
Alhark	7-24	Loam, silt loam	CL-ML, ML	A-4	0	90-100	85-100	70-100	55-85	25-35	5-10
	24-60	Loam, silt loam, silty clay loam.	CL-ML, CL	A-4, A-6	0	90-100	85-100	70-100	60-85	25-35	5-15

See footnote at end of table.

TABLE 13.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
AFD----------	0-12	Silt loam--------	CL-ML, CL	A-4, A-6	0	80-100	75-100	65-100	50-85	25-35	5-15
Ant Flat	12-47	Clay loam, silty clay, silty clay loam.	CL, CH	A-6, A-7	0	80-100	75-100	70-100	55-95	35-60	15-35
	47-60	Silty clay loam, silty clay, clay.	CL, CH	A-6, A-7	0	80-100	75-100	75-100	65-95	35-60	15-35
BAD----------	0-19	Silt loam--------	CL-ML	A-4	0-10	90-100	80-95	70-85	60-70	20-30	5-10
Baird Hollow	19-26	Cobbly sandy clay loam, clay loam, gravelly clay loam.	CL	A-6, A-7	30-50	80-95	75-90	70-85	50-60	35-45	15-20
	26-60	Extremely cobbly clay loam, cobbly clay, very cobbly clay loam.	CL	A-6, A-7	40-65	70-95	65-90	60-85	50-75	35-50	15-25
BB----------	0-16	Silt loam--------	CL, CL-ML	A-4	0	100	100	90-100	75-90	20-30	5-10
Bear Lake	16-47	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	100	100	90-100	75-95	20-35	5-15
	47-60	Coarse sand, very gravelly loamy sand, gravelly sand.	GW, SP, GP, SP-SM	A-1, A-2, A-3	0	30-100	25-100	15-60	0-15	---	NP
BC----------	0-8	Silt loam--------	CL, CL-ML	A-4	0	100	100	90-100	70-90	20-30	5-10
Bear Lake	8-60	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	100	100	90-100	80-95	20-35	5-15
BD----------	0-16	Silty clay loam	CL, CL-ML	A-4, A-6	0	100	100	95-100	85-95	25-35	5-15
Bear Lake	16-60	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	100	100	90-100	80-95	20-35	5-15
BEF----------	0-5	Very gravelly loam.	GM-GC	A-4, A-2	0-10	40-55	35-50	30-50	25-40	25-30	5-10
Bequinn	5-26	Very gravelly loam, very gravelly sandy loam.	GM, GM-GC	A-1, A-2	0-35	30-40	25-35	15-30	10-25	20-30	NP-10
	26-60	Extremely gravelly loamy sand, extremely gravelly sand.	GP-GM	A-1	0-15	20-35	15-30	10-20	5-10	15-20	NP-5
BFB----------	0-8	Silt loam--------	CL-ML, CL	A-4	0	95-100	90-100	75-95	55-75	25-35	5-10
Bereniceton	8-60	Loam, silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	80-100	75-100	65-100	50-85	25-35	5-15
BGE----------	0-6	Gravelly loam----	SM-SC, GM-GC	A-4	0	65-80	60-75	60-65	40-50	25-30	5-10
Bereniceton	6-60	Loam, silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	80-100	75-100	65-100	50-85	25-35	5-15
BHA----------	0-8	Loam----------	CL-ML	A-4	0	100	100	85-95	60-75	20-30	5-10
Bockston	8-24	Silt loam, loam	CL-ML, ML	A-4	0	90-100	85-100	70-100	55-90	20-35	5-10
	24-40	Fine sandy loam, gravelly sandy loam.	SM	A-2, A-4	0	65-95	60-90	40-75	15-50	25-30	5-10
	40-60	Very gravelly loamy fine sand, very gravelly fine sandy loam.	GM, SM	A-1, A-2	0-5	25-55	20-50	15-45	5-30	15-25	NP-5

See footnote at end of table.

TABLE 13.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
BHB---------- Bockston	0-7	Loam----------	CL-ML	A-4	0	100	100	85-95	60-75	20-30	5-10
	7-43	Silt loam, loam	CL-ML, ML	A-4	0	90-100	85-100	70-100	55-90	20-35	5-10
	43-60	Fine sandy loam, gravelly sandy loam.	SM	A-2, A-4	0	65-95	60-90	40-75	15-50	25-30	5-10
BJC---------- Bullnel	0-11	Loam----------	CL-ML	A-4	0	85-100	80-100	75-95	60-75	20-30	5-10
	11-35	Gravelly loam, clay loam, gravelly clay loam.	GM-GC, GC, CL-ML, CL	A-4, A-2	0-15	60-70	55-85	45-70	35-65	25-35	5-15
	35-39	Very gravelly loam, very gravelly clay loam, loam.	GM-GC, GC, CL-ML, CL	A-2, A-4, A-6	0-35	40-90	35-85	30-75	25-60	25-35	5-15
	39	Weathered bedrock	---	---	---	---	---	---	---	---	---
BJE---------- Bullnel	0-12	Loam----------	CL-ML	A-4	0	85-100	80-100	75-95	60-75	20-30	5-10
	12-31	Gravelly loam, gravelly silty clay loam, gravelly clay loam.	GM-GC, GC, CL-ML, CL	A-4, A-2	0-15	60-70	55-75	45-70	35-65	25-35	5-15
	31-39	Very cobbly loam, very gravelly clay loam, loam.	GM-GC, GC, CL-ML, CL	A-2, A-4, A-6	0-35	40-90	35-85	30-75	25-60	25-35	5-15
	39	Weathered bedrock	---	---	---	---	---	---	---	---	---
CA---------- Canburn	0-24	Silt loam--------	ML, CL-ML	A-4	0	100	95-100	85-95	65-80	25-35	5-10
	24-60	Clay loam, loam, silt loam.	CL, CL-ML	A-4, A-6	0	100	90-100	75-95	60-80	25-40	5-15
CBD*:											
Cloud Rim-------	0-13	Loam----------	CL, CL-ML	A-6, A-4	0-5	90-100	85-95	70-90	60-70	25-35	5-15
	13-70	Silty clay loam, loam.	CL	A-6	0-5	95-100	90-100	85-100	75-85	30-40	10-20
McCarey---------	0-10	Loam----------	CL-ML	A-4	0	100	95-100	90-95	65-75	20-30	5-10
	10-22	Clay loam, silty clay loam.	CL	A-6	0	100	95-100	95-100	70-90	30-40	10-15
	22-29	Sandy loam, fine sandy loam.	SM-SC	A-2, A-4	0	95-100	90-100	60-75	30-50	20-30	5-10
	29	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
CCE---------- Cluff	0-14	Gravelly loam----	GM-GC, CL-ML	A-4	20-30	65-75	60-70	50-65	40-55	20-30	5-10
	14-41	Extremely gravelly clay loam, extremely gravelly sandy clay loam.	GC	A-2, A-7	15-30	35-60	30-50	25-45	20-40	40-50	15-25
	41	Weathered bedrock	---	---	---	---	---	---	---	---	---
CDD---------- Condie	0-4	Gravelly loam----	GM, GC, GM-GC, SM	A-2, A-4	0-10	55-75	50-70	35-60	30-50	20-30	NP-10
	4-31	Gravelly clay loam, gravelly fine sandy loam, cobbly clay loam.	GM, GC, ML, CL	A-2, A-4, A-6	0-30	50-75	50-70	40-65	30-60	30-40	5-15
	31-60	Extremely gravelly loam, extremely gravelly sandy loam, very gravelly clay loam.	GM, GC, GM-GC, GP-GM	A-2, A-1	0-10	25-40	20-35	10-30	5-25	20-30	NP-10

See footnote at end of table.

TABLE 13.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
CDE---------- Condie	0-5	Gravelly loam----	GM, GC, GM-GC, SM	A-2, A-4	0-10	55-75	50-70	35-60	30-50	20-30	NP-10
	5-20	Gravelly clay loam, gravelly fine sandy loam, cobbly clay loam.	GM, GC, ML, CL	A-2, A-4, A-6	0-30	50-75	50-70	40-65	30-60	30-40	5-15
	20-40	Extremely gravelly clay loam, extremely gravelly sandy loam.	GM, GC, GM-GC, GP-GM	A-2, A-1	0-10	25-40	20-35	10-30	5-25	20-30	NP-10
	40-60	Very gravelly clay loam, very gravelly fine sandy loam.	GM, GC, ML, CL	A-4, A-6	5-15	50-70	45-65	40-60	35-55	30-40	5-15
CEA---------- Cowco	0-8	Loam----------	CL-ML	A-4	0	100	100	85-100	60-90	20-30	5-10
	8-60	Silt loam, silty clay loam.	CL-ML, CL	A-4, A-6	0	95-100	95-100	90-100	85-95	25-35	5-15
CEB---------- Cowco	0-9	Loam----------	CL-ML	A-4	0	100	100	85-100	60-90	20-30	5-10
	9-60	Silt loam, silty clay loam.	CL-ML, CL	A-4, A-6	0	95-100	95-100	90-100	85-95	25-35	5-15
CFA---------- Cowco	0-6	Silty clay loam	CL	A-6	0	100	100	95-100	85-95	25-35	10-15
	6-38	Silty clay loam, silt loam.	CL	A-6, A-4	0	95-100	90-100	90-100	85-95	25-35	5-15
	38-60	Silty clay loam, loam.	CL	A-6	0	95-100	90-100	75-100	55-85	30-40	10-15
CGD---------- Cutoff	0-9	Gravelly loam----	SM-SC, GM-GC	A-4	0-5	65-80	60-75	50-65	40-50	20-25	5-10
	9-22	Very gravelly loam, gravelly loam, very cobbly loam.	GM-GC, SM-SC	A-4, A-2	0-30	55-80	50-75	40-60	30-50	20-25	5-10
	22-26	Very gravelly loam, very cobbly loam, extremely cobbly loam.	GM-GC	A-2, A-4	5-50	35-75	30-70	25-65	20-50	20-25	5-10
	26	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
CGF---------- Cutoff	0-5	Gravelly loam----	SM-SC, GM-GC	A-4	0-5	65-80	60-75	50-65	40-50	20-25	5-10
	5-13	Very gravelly loam, gravelly loam, very cobbly loam.	GM-GC, SM-SC	A-4, A-2	0-30	55-80	50-75	40-60	30-50	20-25	5-10
	13-35	Very gravelly loam, very cobbly loam.	GM-GC	A-2, A-4	5-50	35-75	30-70	25-65	20-50	20-25	5-10
	35	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 13.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
CHF*:											
Cutoff	0-5	Gravelly loam	SM-SC, GM-GC	A-4	0-5	65-80	60-75	50-65	40-50	20-25	5-10
	5-11	Very gravelly loam, gravelly loam, very cobbly loam.	GM-GC, SM-SC	A-4, A-2	0-30	55-80	50-75	40-60	30-50	20-25	5-10
	11-39	Very gravelly loam, very cobbly loam, extremely cobbly loam.	GM-GC	A-2, A-4	5-50	35-75	30-70	25-65	20-50	20-25	5-10
	39	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Falula	0-5	Gravelly loam.	CL-ML	A-4	0-5	70-95	65-85	60-75	55-70	20-30	5-10
	5-18	Very gravelly loam, very gravelly sandy loam, very cobbly loam.	GM-GC	A-2	0-50	30-60	25-55	15-50	15-35	20-25	5-10
	18	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
DAF Dagan	0-15	Gravelly loam	CL-ML, GM-GC	A-2, A-4	0-5	55-75	50-70	40-65	30-60	25-30	5-10
	15-22	Extremely gravelly silt loam, very cobbly loam, very gravelly loam.	GM-GC	A-2, A-4	0-35	35-60	30-55	25-50	20-45	25-30	5-10
	22-50	Extremely gravelly silt loam, very cobbly sandy loam, extremely gravelly loam.	GP-GC, GM-GC	A-2	0-60	30-60	25-55	15-45	10-35	20-30	5-10
	50	Weathered bedrock	---	---	---	---	---	---	---	---	---
DBF Dagan	0-12	Very stony loam	GM-GC	A-2, A-4	15-40	40-60	35-55	30-50	25-40	25-30	5-10
	12-29	Extremely gravelly silt loam, very cobbly loam, very gravelly loam.	GM-GC	A-2, A-4	0-35	35-60	30-55	25-50	20-45	25-30	5-10
	29-50	Extremely gravelly silt loam, very cobbly sandy loam, extremely gravelly loam.	GP-GC, GM-GC	A-2	0-60	30-60	25-55	15-45	10-35	20-30	5-10
	50	Weathered bedrock	---	---	---	---	---	---	---	---	---
DCF Dagan	0-15	Gravelly silt loam.	CL-ML, GM-GC	A-2, A-4	0-5	55-75	50-70	40-65	30-60	25-30	5-10
	15-28	Extremely gravelly silt loam, very cobbly loam, very gravelly loam.	GM-GC	A-2, A-4	0-35	35-60	30-55	25-50	20-45	25-30	5-10
	28-60	Extremely gravelly silt loam, very cobbly sandy loam, extremely gravelly loam.	GM-GC, GM	A-2	0-60	30-60	25-55	15-45	10-35	20-30	5-10

See footnote at end of table.

TABLE 13.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
DDF*:											
Dagan	0-10	Very stony loam	GM-GC	A-2, A-4	15-40	40-60	35-55	30-50	25-40	25-30	5-10
	10-28	Extremely gravelly silt loam, very cobbly loam, very gravelly loam.	GM-GC	A-2, A-4	0-35	35-60	30-55	25-50	20-45	25-30	5-10
	28-41	Extremely gravelly silt loam, extremely cobbly sandy loam, extremely gravelly loam.	GP-GC, GM-GC	A-2	0-60	30-60	25-55	15-45	10-35	20-30	5-10
	41	Weathered bedrock	---	---	---	---	---	---	---	---	---
Rubble Land.											
DEE	0-15	Loam	CL-ML	A-4	0	85-95	80-90	65-85	60-75	20-30	5-10
Dennot	15-20	Very gravelly loam.	GM-GC	A-2	0-10	35-55	30-50	25-45	20-35	20-30	5-10
	20-50	Extremely gravelly sandy loam, very gravelly loam, extremely cobbly fine sandy loam.	GM-GC	A-2	0-30	30-65	25-60	15-50	10-35	20-25	5-10
	50	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
DFC	0-7	Very gravelly loam.	GM-GC	A-2, A-4	0-20	45-65	40-60	35-55	25-45	20-30	5-10
Dennot	7-28	Very gravelly loam, extremely gravelly loam.	GM-GC	A-2	0-10	35-55	30-50	25-45	20-35	20-30	5-10
	28-60	Extremely gravelly sandy loam, very gravelly loam, extremely cobbly fine sandy loam.	GM-GC	A-2	0-30	30-65	25-60	15-50	10-35	20-25	5-10
DGF	0-16	Gravelly loam	CL-ML	A-4	5-10	75-95	70-90	65-85	50-70	20-30	5-10
Despain	16-40	Gravelly clay loam, gravelly loam, cobbly loam.	GM-GC, GC, CL, CL-ML	A-2, A-4, A-6	10-20	65-80	60-75	30-70	25-60	20-35	5-15
	40-60	Very gravelly loam, gravelly loam, very cobbly loam.	GM-GC	A-2	15-20	35-45	30-40	25-40	20-30	20-30	5-10
DHB	0-18	Gravelly loam	GM-GC, SM-SC	A-4	0	60-75	55-70	50-65	35-50	20-30	5-10
Despain Variant	18-37	Very gravelly loam.	GM-GC	A-4, A-2	0-5	45-55	40-50	35-50	25-40	20-30	5-10
	37-60	Extremely gravelly loam, extremely cobbly loam, extremely gravelly sandy loam.	GM-GC	A-2	15-50	25-35	20-30	15-25	10-20	20-30	5-10

See footnote at end of table.

TABLE 13.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
DJA---------- Duckree	0-14	Loam----------	CL-ML	A-4	0	80-95	75-90	65-85	60-70	20-30	5-10
	14-32	Very gravelly loam, very gravelly sandy loam, extremely gravelly fine sandy loam.	GM-GC, GM	A-1, A-2	0-10	25-60	20-55	15-50	10-35	20-30	NP-10
	32-60	Extremely gravelly loamy sand.	GP-GM	A-1	5-25	30-45	25-40	15-30	5-10	15-20	NP-5
DKD---------- Duckree	0-2	Gravelly loam----	CL-ML	A-4	0-10	60-80	55-75	50-65	50-60	20-30	5-10
	2-60	Very gravelly loam, very gravelly sandy loam, extremely gravelly fine sandy loam.	GM-GC, GM	A-1, A-2	0-10	25-60	20-55	15-50	10-35	20-30	NP-10
DLE---------- Duckree	0-6	Gravelly silt loam.	CL-ML	A-4	0-10	60-80	55-75	50-65	50-60	20-30	5-10
	6-28	Very gravelly loam, very gravelly sandy loam, extremely gravelly fine sandy loam.	GM-GC, GM	A-1, A-2	0-10	25-60	20-55	15-50	10-35	20-30	NP-10
	28-60	Extremely gravelly loamy sand.	GP-GM	A-1	5-25	30-45	25-40	15-30	5-10	15-20	NP-5
DMF*:											
Duckree---------	0-5	Very gravelly loam.	GM-GC, CL-ML	A-2, A-4	0-10	40-80	35-75	30-65	25-60	20-30	5-10
	5-60	Very gravelly loam, very gravelly sandy loam, extremely gravelly sandy loam.	GM-GC, GM	A-1, A-2	0-10	25-60	20-55	15-50	10-35	20-30	NP-10
St. Marys-------	0-17	Gravelly loam----	GM-GC, SM-SC	A-2, A-4	5-30	60-80	50-70	40-60	30-50	15-25	5-10
	17-25	Very cobbly fine sandy loam, very gravelly loam, gravelly fine sandy loam.	GM, SM	A-2, A-4	25-75	55-70	40-65	35-60	25-50	15-25	NP-5
	25-50	Extremely gravelly fine sandy loam, very gravelly loam.	GM-GC, SM-SC	A-2, A-4	0-10	50-80	45-75	35-65	20-50	15-25	5-10
	50	Bedrock.	---	---	---	---	---	---	---	---	---
EAC---------- Ellett	0-3	Silt loam--------	CL-ML	A-4	0-5	90-100	85-100	80-100	70-90	25-30	5-10
	3-14	Loam, silt loam, shaly loam.	CL-ML, CL, GM-GC, GC	A-4, A-6	0-15	70-100	65-100	55-90	45-80	25-35	5-15
	14	Weathered bedrock	---	---	---	---	---	---	---	---	---
EAE---------- Ellett	0-4	Silt loam--------	CL-ML	A-4	0-5	90-100	85-100	80-100	70-90	25-30	5-10
	4-14	Loam, silt loam, shaly loam.	CL-ML, CL, GM-GC, GC	A-4, A-6	0-15	70-100	65-100	55-90	45-80	25-35	5-15
	14	Weathered bedrock	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 13.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
EBD----------	0-16	Loam----------	CL-ML	A-4	0	80-100	75-100	65-95	50-75	20-30	5-10
Ercan	16-28	Fine sandy loam, loam, cobbly clay loam.	ML, CL-ML, SM, SM-SC	A-4	0-30	75-100	70-100	60-90	40-75	20-30	NP-10
	28-57	Clay loam, sandy clay loam, gravelly clay loam.	CL, GC	A-6, A-2	0	60-100	50-100	45-90	25-75	25-35	10-15
	57	Weathered bedrock	---	---	---	---	---	---	---	---	---
EBE----------	0-19	Loam----------	CL-ML	A-4	0	80-100	75-100	65-95	50-75	20-30	5-10
Ercan	19-40	Sandy loam, loam, cobbly clay loam.	ML, CL-ML, SM, SM-SC	A-4	0-30	75-100	70-100	60-90	40-75	20-30	NP-10
	40-60	Clay loam, sandy clay loam, gravelly clay loam.	CL, GC	A-6, A-2	0	60-100	50-100	45-90	25-75	25-35	10-15
ECE----------	0-4	Very cobbly loam	GM-GC, GC	A-2, A-4	50-70	50-75	45-70	40-60	30-50	20-30	5-10
Etchen	4-29	Cobbly sandy clay loam, extremely gravelly sandy clay loam, very gravelly clay loam.	GC, SC	A-2, A-6	30-70	50-75	45-70	40-60	20-45	30-40	10-15
	29	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
FAE----------	0-10	Very gravelly loam.	GM-GC	A-2	10-25	30-55	25-50	20-50	15-35	20-25	5-10
Falula	10-17	Very gravelly loam, very gravelly sandy loam, very cobbly loam.	GM-GC	A-2	0-50	30-60	25-55	15-50	15-35	20-25	5-10
	17	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
FBC----------	0-7	Gravelly silt loam.	GM-GC, CL-ML, SM-SC	A-2, A-4	0-10	55-90	50-85	40-75	30-60	20-30	5-10
Falula	7-16	Very gravelly silt loam, very gravelly sandy loam, very cobbly loam.	GM-GC	A-2	0-50	30-60	25-55	15-50	15-35	20-25	5-10
	16	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
FCE*:											
Falula----------	0-10	Gravelly loam----	GM-GC, CL-ML, SM-SC	A-2, A-4	0-10	55-90	50-85	40-75	30-60	20-30	5-10
	10-18	Extremely gravelly loam, very gravelly sandy loam, very cobbly loam.	GM-GC	A-2	0-50	30-60	25-55	15-50	15-35	20-25	5-10
	18	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Kearl----------	0-11	Silt loam--------	CL-ML	A-4	0	80-100	75-100	70-100	55-90	20-25	5-10
	11-25	Loam, sandy loam	CL-ML, SM-SC	A-2, A-4	0	80-100	75-100	50-90	30-70	20-25	5-10
	25	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 13.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
FDF---------- Flygare	0-25	Gravelly loam----	CL-ML, CL, SC, SM-SC	A-4	10-40	80-90	60-90	50-75	40-65	20-30	5-10
	25-37	Cobbly loam, very cobbly loam, cobbly fine sandy loam.	GM-GC, GC	A-2, A-4	30-60	50-70	40-60	35-55	20-40	20-30	5-10
	37-60	Cobbly sandy clay loam, extremely gravelly clay loam, very cobbly sandy clay loam.	GM-GC, GC, SM-SC, SC	A-2, A-4	25-50	60-75	40-70	35-60	25-50	20-30	5-10
FEE*:											
Fontreen---------	0-14	Gravelly silt loam.	GM-GC, SM-SC	A-2, A-4	5-25	60-75	55-75	45-65	30-50	20-30	5-10
	14-60	Very gravelly loam, extremely gravelly loam.	GM-GC	A-2, A-1	5-10	25-45	20-40	15-30	10-20	20-30	5-10
Rexmont----------	0-3	Gravelly loam----	GM-GC	A-4	0	55-65	50-60	45-55	35-45	25-30	5-10
	3-10	Very cobbly loam, very gravelly loam.	GM-GC	A-2, A-4	0-50	50-60	45-55	40-50	30-40	25-30	5-10
	10	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
FFF---------- Foxol	0-7	Extremely stony sandy loam.	GM-GC, GC	A-2	25-60	40-60	30-45	25-40	20-35	20-30	5-10
	7-16	Extremely cobbly loam, very gravelly loam.	GM-GC, GC	A-2	20-60	40-60	30-45	25-40	20-35	20-30	5-10
	16	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
FGE---------- Foxol	0-10	Very stony loam	GM-GC, GC	A-2	25-60	40-60	30-45	25-40	20-35	20-30	5-10
	10-15	Very cobbly loam, very gravelly loam, extremely cobbly loam.	GM-GC, GC	A-2	20-60	40-60	30-45	25-40	20-35	20-30	5-10
	15	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
GAD---------- Gobine	0-7	Silt loam--------	CL, CL-ML, ML	A-4	0	90-100	85-100	75-100	60-90	20-30	NP-10
	7-48	Silt loam--------	CL-ML	A-4	0	95-100	95-100	95-100	85-95	20-30	5-10
	48-60	Silt loam, loam	CL-ML	A-4	---	80-100	75-100	65-95	60-90	20-30	5-10
GBE*:											
Gridge----------	0-6	Stony loam-------	CL-ML, GM-GC, SM-SC	A-4	0-15	70-80	65-75	55-65	45-55	25-30	5-10
	6-17	Silt loam, gravelly silt loam, loam.	CL-ML	A-4	0-5	85-100	65-100	60-95	50-85	25-30	5-10
	17	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
GCE---------- Guilder	0-11	Loam-------------	CL-ML, CL	A-4, A-6	0	90-100	85-100	70-95	60-80	25-35	5-15
	11-34	Clay loam, silty clay loam, silty clay.	CL	A-6, A-7	0	90-100	85-100	75-95	65-95	35-45	15-25
	34-54	Silty clay loam, loam.	CL	A-6, A-7	0	90-100	85-100	70-95	60-95	30-45	10-20
	54	Weathered bedrock	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 13.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
HAB---------- Hades	0-24	Silt loam--------	CL-ML	A-4	0	75-100	75-100	60-95	50-85	25-30	5-10
	24-52	Loam, silty clay loam.	CL	A-6	0-10	75-100	75-100	65-95	50-85	25-35	10-15
	52-60	Very gravelly loam.	GM-GC	A-2, A-4	0-10	45-65	40-60	35-50	25-45	20-30	5-10
HBD---------- Hawkins	0-10	Silty clay loam	CL, CH	A-7	0	100	95-100	90-100	85-95	40-55	15-30
	10-60	Clay loam, silty clay loam, clay.	CL, CH	A-7	0	100	95-100	90-100	80-95	40-60	15-35
HC---------- Hival	0-5	Silty clay loam	CL	A-6	0	100	100	95-100	85-95	35-40	10-15
	5-32	Clay----------	CH	A-7	0	100	100	90-100	75-95	50-55	30-35
	32-60	Clay, silty clay	CH, CL	A-7	0	100	100	90-100	75-95	40-55	25-35
HDC---------- Horrocks	0-11	Gravelly loam----	SM-SC, SC	A-4	0-20	80-95	60-70	55-65	40-45	20-30	5-10
	11-24	Very cobbly sandy clay loam, very gravelly sandy clay loam.	GM-GC, GC, SM-SC, SC	A-2	5-65	60-75	50-60	35-45	20-35	20-30	5-10
	24-41	Gravelly sandy loam.	SM, GM, GM-GC, SM-SC	A-1, A-2	0-5	60-80	55-75	35-50	20-30	20-30	NP-10
	41	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
HEF---------- Hourglass	0-13	Silt loam--------	CL-ML	A-4	0	90-100	85-95	80-90	70-80	20-30	5-10
	13-25	Silty clay loam, cobbly silty clay loam, gravelly clay loam.	GC, CL	A-6	0-15	55-80	50-75	45-70	40-65	30-40	10-15
	25-41	Gravelly silt loam, gravelly loam, extremely cobbly loam.	GM-GC, CL-ML, SM-SC	A-4	10-60	65-80	60-75	55-70	40-60	20-30	5-10
	41	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
JAE---------- Jebo	0-11	Very gravelly loam.	GM-GC	A-2	0-10	45-65	40-50	35-45	25-35	25-30	5-10
	11-18	Very gravelly loam.	GM-GC	A-2	0-15	35-60	30-50	25-50	20-35	25-30	5-10
	18-26	Very gravelly loam, extremely gravelly sandy loam, very cobbly loam.	GM-GC, GM	A-1, A-2	0-35	35-60	30-50	20-50	15-35	20-30	NP-10
	26	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
JAF---------- Jebo	0-10	Very gravelly loam.	GM-GC	A-2	0-10	45-65	40-50	35-45	25-35	25-30	5-10
	10-16	Very gravelly loam.	GM-GC	A-2	0-15	35-60	30-50	25-50	20-35	25-30	5-10
	16-24	Very gravelly loam, very gravelly sandy loam, very cobbly loam.	GM-GC, GM	A-1, A-2	0-15	35-60	30-50	20-50	15-35	20-30	NP-10
	24-35	Very cobbly loam, extremely cobbly sandy loam, extremely gravelly sandy loam.	GM-GC, GM, SM, SM-SC	A-1, A-2, A-4	20-40	50-75	35-60	30-60	15-50	20-30	NP-10
	35	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 13.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
KAF----------	0-13	Loam----------	CL-ML	A-4	0-5	75-85	75-85	70-80	50-60	20-30	5-10
Kamack	13-20	Sandy loam-------	SM	A-2	0-5	75-85	75-85	60-75	35-50	20-25	NP-5
	20-41	Very gravelly loam, very gravelly sandy clay loam, very cobbly loam.	GM-GC	A-2	0-35	25-50	20-45	15-40	10-30	20-30	5-10
	41	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
KBD----------	0-13	Loam----------	CL-ML	A-4	0	80-100	75-100	70-100	55-90	20-25	5-10
Kearl	13-19	Loam, sandy loam	CL-ML, SM-SC	A-2, A-4	0	80-100	75-100	50-90	30-70	20-25	5-10
	19-36	Loam, fine sandy loam.	CL-ML, SM-SC	A-4	0	80-100	75-100	60-90	40-70	20-25	5-10
	36	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
KBE----------	0-13	Loam----------	CL-ML	A-4	0	80-100	75-100	70-100	55-90	20-25	5-10
Kearl	13-37	Loam, sandy loam	CL-ML, SM-SC	A-2, A-4	0	80-100	75-100	50-90	30-70	20-25	5-10
	37	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
KBF----------	0-11	Loam----------	CL-ML	A-4	0	80-100	75-100	70-100	55-90	20-25	5-10
Kearl	11-35	Loam, sandy loam	CL-ML, SM-SC	A-2, A-4	0	80-100	75-100	50-90	30-70	20-25	5-10
	35	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
KCD*:											
Kearl----------	0-16	Sandy loam-------	SM-SC	A-2, A-4	0	80-100	75-100	45-70	25-40	20-25	5-10
	16-21	Loam, sandy loam	CL-ML, SM-SC	A-2, A-4	0	80-100	75-100	50-90	30-70	20-25	5-10
	21-28	Loam, fine sandy loam.	CL-ML, SM-SC	A-4	0	80-100	75-100	60-90	40-70	20-25	5-10
	28	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Richville-------	0-3	Loam----------	CL, CL-ML	A-4, A-6	0	80-100	75-100	70-95	50-70	20-30	5-15
	3-24	Loam, clay loam, gravelly clay loam.	CL, CL-ML	A-4, A-6	0-10	80-100	70-100	65-95	50-75	25-35	5-15
	24	Weathered bedrock	---	---	---	---	---	---	---	---	---
LAD----------	0-8	Silt loam--------	CL-ML	A-4	0	95-100	90-95	85-95	70-85	25-30	5-10
Lakridge	8-14	Silt loam--------	CL-ML	A-4	0	95-100	90-95	85-95	70-85	25-30	5-10
	14-27	Loam, silt loam	CL-ML	A-4	0	85-95	75-90	65-85	55-75	25-30	5-10
	27	Indurated--------	---	---	---	---	---	---	---	---	---
LBC----------	0-9	Fine sandy loam	SM, SM-SC	A-2, A-4	0	95-100	90-100	70-85	30-50	20-30	NP-10
Lariat	9-32	Sandy loam, fine sandy loam, loam.	SM, CL-ML, ML, SM-SC	A-2, A-4	0-15	85-100	80-100	65-85	30-55	20-30	NP-10
	32	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
LCD----------	0-10	Silt loam--------	CL-ML	A-4	0	80-100	75-100	65-100	50-90	20-30	5-10
Lonjon	10-16	Gravelly silt loam, gravelly loam.	GM-GC, SM-SC	A-4	0	55-75	50-70	45-60	35-50	20-30	5-10
	16-30	Very gravelly loam, extremely gravelly loam.	GM-GC	A-2	0-20	25-40	20-35	15-35	15-30	20-30	5-10
	30	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 13.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
LCE----------	0-10	Silt loam--------	CL-ML	A-4	0	80-100	75-100	65-100	50-90	20-30	5-10
Lonjon	10-16	Gravelly silt loam, gravelly loam.	GM GC, SM-SC	A-4	0	55-75	50-70	45-60	35-50	20-30	5-10
	16-27	Very gravelly loam, extremely gravelly loam.	GM-GC	A-2	0-20	25-40	20-35	15-35	15-30	20-30	5-10
	27	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
LDD----------	0-18	Gravelly loam----	GM-GC, CL-ML, SM-SC	A-4	0-20	60-90	50-70	45-65	35-60	20-30	5-10
Lucky Star											
	18-40	Extremely cobbly loam, very cobbly fine sandy loam, very gravelly loam.	SM-SC, SM, GM-GC, GM	A-2, A-4, A-1	15-60	60-75	50-70	20-65	10-50	15-30	NP-10
	40-60	Extremely cobbly clay loam, very gravelly clay loam, very cobbly loam.	GC	A-2, A-6	20-35	40-50	35-45	30-45	30-40	30-40	10-15
LDF----------	0-13	Gravelly loam----	GM-GC, CL-ML, SM-SC	A-4	0-20	60-90	50-70	45-65	35-60	20-30	5-10
Lucky Star											
	13-40	Gravelly loam, gravelly fine sandy loam.	SM-SC, GM-GC, CL-ML	A-4	0-5	60-90	50-70	45-65	35-60	20-30	5-10
	40-60	Very gravelly sandy clay loam, very gravelly clay loam, very cobbly loam.	GC	A-2, A-6	20-35	40-50	35-45	30-45	30-40	30-40	10-15
LEF*:											
Lucky Star------	0-13	Gravelly loam----	GM-GC, CL-ML, SM-SC	A-4	0-20	60-90	50-70	45-65	35-60	20-30	5-10
	13-40	Gravelly loam, gravelly fine sandy loam.	SM-SC, GM-GC, CL-ML	A-4	0-5	60-90	50-70	45-65	35-60	20-30	5-10
	40-60	Very gravelly sandy clay loam, very gravelly clay loam, very cobbly loam.	GC	A-2, A-6	20-35	40-50	35-45	30-45	30-40	30-40	10-15
Condie----------	0-15	Gravelly loam, gravelly sandy loam.	GM, GC, GM-GC, SM	A-2, A-4	0-10	55-75	50-70	35-60	30-50	20-30	NP-10
	15-60	Very gravelly clay loam, very gravelly fine sandy loam.	GM, GC, ML, CL	A-4, A-6	5-15	50-70	45-65	40-60	35-55	30-40	5-15
LFF*:											
Lundy----------	0-8	Very gravelly loam.	GM-GC	A-2	0-20	30-40	25-35	20-35	15-30	20-30	5-10
	8-16	Very flaggy clay loam, very cobbly loam, extremely flaggy clay loam.	GM-GC, GC	A-2	25-50	30-50	25-45	20-40	15-35	25-35	5-15
	16	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 13.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
LFF*:											
Rock outcrop.											
MAA----------	0-8	Sandy loam-------	SM, SM-SC	A-2, A-4	0	100	100	60-70	30-40	15-25	NP-5
Matheson	8-38	Sandy loam-------	SM, SM-SC	A-2	0	100	100	55-65	25-35	15-20	NP-5
	38-60	Sand, coarse sand, gravelly sand.	SP-SM, SM	A-1, A-2, A-3	0	80-100	75-100	40-70	5-15	---	NP
MBE*:											
Mirror Lake-----	0-3	Sandy loam-------	SM	A-2	0-5	80-95	75-90	50-65	25-35	---	NP-5
	3-11	Gravelly loamy sand, cobbly loamy sand.	GM, SM, GP-GM, SP-SM	A-1	10-30	55-75	50-70	25-50	10-20	---	NP
	11-60	Very gravelly sand, very cobbly sand.	GP-GM, SP-SM, GM, SM	A-1	10-30	40-65	35-60	30-45	5-20	---	NP
Sambrito--------	0-4	Sandy loam-------	SM	A-2, A-4	0	90-100	85-100	50-70	30-40	---	NP
	4-60	Gravelly sandy loam, fine sandy loam.	SM	A-1, A-2	5-15	70-90	50-85	25-40	15-30	---	NP
MCD*:											
Mult----------	0-10	Loam-------------	CL-ML, CL	A-4, A-6	0	90-100	85-95	80-95	75-85	25-35	5-15
	10-38	Silty clay loam, clay loam, silt loam.	CL	A-6	0	90-100	85-95	80-95	75-85	30-40	10-20
	38	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Agassiz---------	0-5	Very stony loam	GM-GC, SM-SC	A-4	30-50	60-80	50-70	45-65	35-50	20-30	5-10
	5-12	Very cobbly silty clay loam, very cobbly loam, very gravelly loam.	CL, CL-ML, GC, GM-GC	A-2, A-4, A-6	20-50	55-75	45-70	40-65	30-60	20-35	5-15
	12	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
MDC*:											
Murphy----------	0-4	Clay loam--------	CL	A-6	0	80-100	75-100	75-100	60-80	30-40	10-20
	4-11	Clay loam, silty clay loam.	CL	A-6, A-7	0	90-100	85-100	80-100	65-95	30-45	10-20
	11-60	Clay loam, clay, silty clay loam.	CL	A-6, A-7	0	90-100	85-100	80-100	65-95	30-50	10-25
Richville-------	0-3	Loam-------------	CL, CL-ML	A-4, A-6	0	80-100	75-100	70-95	50-70	20-30	5-15
	3-24	Loam, clay loam, gravelly clay loam.	CL, CL-ML	A-4, A-6	0-10	80-100	70-100	65-95	50-75	25-35	5-15
	24	Weathered bedrock	---	---	---	---	---	---	---	---	---
MDE*:											
Murphy----------	0-10	Clay loam--------	CL	A-6	0	80-100	75-100	75-100	60-80	30-40	10-20
	10-16	Clay loam, silty clay loam.	CL	A-6, A-7	0	90-100	85-100	80-100	65-95	30-45	10-20
	16-60	Clay loam, clay, silty clay.	CL	A-6, A-7	0	90-100	85-100	80-100	65-95	30-50	10-25
Richville-------	0-3	Loam-------------	CL, CL-ML	A-4, A-6	0	80-100	75-100	70-95	50-70	20-30	5-15
	3-24	Loam, clay loam, gravelly clay loam.	CL, CL-ML	A-4, A-6	0-10	80-100	70-100	65-95	50-75	25-35	5-15
	24	Weathered bedrock	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 13.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
NAD---------- Neponset	0-6	Sandy loam-------	SM-SC	A-2, A-4	0	90-100	85-100	55-70	25-40	20-30	5-10
	6-30	Silt loam, loam, gravelly loam.	CL, CL-ML, GM-GC, SM-SC	A-4, A-6	0-5	60-100	55-100	50-100	40-85	25-35	5-15
	30	Weathered bedrock	---	---	---	---	---	---	---	---	---
NBA---------- Nevka	0-4	Loam-------------	CL-ML	A-4	0	100	100	90-100	60-75	25-30	5-10
	4-38	Loam, silt loam, clay loam.	CL-ML, CL	A-4, A-6	0	95-100	90-100	75-100	55-90	25-35	5-15
	38-60	Sand, coarse sand	SP-SM, SM	A-2, A-3, A-1	0	90-100	85-100	40-70	5-15	---	NP
NCA---------- Nevka	0-8	Loam-------------	CL-ML	A-4	0	100	100	90-100	65-75	25-30	5-10
	8-32	Silt loam, loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	95-100	90-100	75-100	55-90	25-35	5-15
	32-60	Fine sand, sand	SM, SP-SM	A-2, A-3	0	90-100	85-100	50-80	5-35	---	NP
PAC---------- Pancheri	0-9	Silt loam--------	ML, CL-ML	A-4	0	95-100	95-100	95-100	85-90	20-30	NP-10
	9-60	Silt loam--------	ML, CL-ML	A-4	0	95-100	95-100	95-100	85-90	20-30	NP-10
PAD, PAE--------- Pancheri	0-6	Silt loam--------	ML, CL-ML	A-4	0	95-100	95-100	95-100	85-90	20-30	NP-10
	6-60	Silt loam--------	ML, CL-ML	A-4	0	95-100	95-100	95-100	85-90	20-30	NP-10
PAE2--------- Pancheri	0-4	Silt loam--------	ML, CL-ML	A-4	0	95-100	95-100	95-100	85-90	20-30	NP-10
	4-60	Silt loam--------	ML, CL-ML	A-4	0	95-100	95-100	95-100	85-90	20-30	NP-10
PBF*: Pancheri--------	0-7	Silt loam--------	ML, CL-ML	A-4	0	95-100	95-100	95-100	85-90	20-30	NP-10
	7-60	Silt loam--------	ML, CL-ML	A-4	0	95-100	95-100	95-100	85-90	20-30	NP-10
Highams Variant-	0-6	Gravelly loam----	GM-GC	A-4	0-5	65-70	60-70	45-65	35-50	25-30	5-10
	6-13	Gravelly loam, cobbly loam.	CL-ML, SM-SC	A-4	10-20	75-90	70-85	60-75	45-65	25-30	5-10
	13	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
PD*: Pits.											
Dumps.											
RAD---------- Ramshorn	0-3	Gravelly loam----	CL-ML	A-4	0-10	70-75	70-75	55-65	45-55	25-30	5-10
	3-60	Extremely gravelly sandy loam, very gravelly loam.	GM	A-2, A-1	0-15	30-65	25-50	15-40	10-35	20-25	NP-5
RBD*: Ramshorn Variant	0-10	Gravelly loam----	SM, GM, GM-GC, SM-SC	A-4	0	55-80	50-75	40-65	35-45	20-30	NP-10
	10-35	Extremely gravelly loam.	GM-GC, GM	A-2, A-1	0	20-30	15-25	10-20	10-15	20-30	NP-10
	35	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Highams----------	0-5	Loam-------------	CL-ML, ML	A-4	0	80-95	75-90	65-85	50-65	20-30	NP-10
	5-17	Extremely gravelly loam, very gravelly loam.	GM-GC, GM	A-1, A-2, A-4	0	25-55	20-50	15-50	10-40	20-30	NP-10
	17	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 13.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
RBE*:											
Ramshorn Variant	0-3	Gravelly loam----	SM, GM, GM-GC, SM-SC	A-4	0	55-80	50-75	40-65	35-45	20-30	NP-10
	3-30	Extremely gravelly loam.	GM-GC, GM	A-2, A-1	0	20-30	15-25	10-20	10-15	20-30	NP-10
	30	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Highams---------	0-6	Loam----------	CL-ML, ML	A-4	0	80-95	75-90	65-85	50-65	20-30	NP-10
	6-14	Extremely gravelly loam.	GM-GC, GM	A-1, A-2, A-4	0	25-55	20-50	15-50	10-40	20-30	NP-10
	14	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
RCG*:											
Rexmont---------	0-8	Gravelly loam----	GM-GC	A-4	0	55-65	50-60	45-55	35-45	25-30	5-10
	8-15	Very cobbly loam, very gravelly loam.	GM-GC	A-2, A-4	0-50	50-60	45-55	40-50	30-40	25-30	5-10
	15	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
RD----------	0-3	Loam----------	CL-ML, CL	A-4	0	100	100	85-95	60-75	25-35	5-10
Rich	3-18	Clay----------	CH, CL	A-7	0	100	100	90-100	75-95	45-60	20-35
	18-60	Loam, silt loam	CL-ML	A-4	0	100	100	85-100	60-90	25-30	5-10
RE----------	0-2	Silt loam--------	CL-ML, CL, ML	A-4	0	100	100	90-100	70-90	25-35	5-10
Rich	2-19	Silty clay, clay	CH, CL	A-7	0	100	100	90-100	75-95	40-60	20-35
	19-60	Loam, fine sandy loam.	CL-ML, ML, SM, SM-SC	A-4	0	100	100	70-95	40-75	25-35	5-10
RFD----------	0-24	Loam----------	CL-ML, CL	A-4, A-6	0-20	80-95	75-95	65-85	50-70	20-30	5-15
Richens	24-60	Clay, silty clay, gravelly silty clay.	CL, CH	A-6, A-7	0	75-100	70-100	65-100	60-95	35-60	15-30
RGF*:											
Richens---------	0-24	Loam----------	CL-ML, CL	A-4, A-6	0-20	80-95	75-95	65-85	50-70	20-30	5-15
	24-60	Clay, silty clay, gravelly silty clay.	CL, CH	A-6, A-7	0	75-100	70-100	65-100	60-95	35-60	15-30
Agassiz---------	0-10	Very stony loam	GM-GC, SM-SC	A-4	30-50	60-80	50-70	45-65	35-50	20-30	5-10
	10-16	Very cobbly silty clay loam, very cobbly loam, extremely gravelly loam.	CL, CL-ML, GC, GM-GC	A-2, A-4, A-6	20-50	55-75	45-70	40-65	30-60	20-35	5-15
	16	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
RHC----------	0-5	Loam----------	CL, CL-ML	A-4, A-6	0	80-100	75-100	70-95	50-70	20-30	5-15
Richville	5-34	Gravelly loam, clay loam, gravelly clay loam.	CL, CL-ML	A-4, A-6	0-10	80-100	70-100	65-95	50-75	25-35	5-15
	34	Weathered bedrock	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 13.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
RHD---------- Richville	0-5	Loam----------	CL, CL-ML	A-4, A-6	0	80-100	75-100	70-95	50-70	20-30	5-15
	5-34	Gravelly loam, clay loam, gravelly clay loam.	CL, CL-ML	A-4, A-6	0-10	80-100	70-100	65-95	50-75	25-35	5-15
	34	Weathered bedrock	---	---	---	---	---	---	---	---	---
SA---------- Saleratus	0-6	Loam----------	CL-ML	A-4	0	100	100	85-95	60-75	20-30	5-10
	6-45	Silt loam, loam, silty clay loam.	CL-ML, CL	A-4, A-6	0	95-100	90-100	90-100	85-100	25-40	5-15
	45-60	Silt loam, silty clay loam, loam.	CL-ML, CL	A-4, A-6	0	90-100	85-100	80-100	60-100	25-40	5-15
SB---------- Saleratus	0-4	Loam----------	CL-ML	A-4	0	100	100	85-95	60-75	20-30	5-10
	4-45	Silt loam, loam, silty clay loam.	CL-ML, CL	A-4, A-6	0	95-100	90-100	90-100	85-100	25-40	5-15
	45-60	Silt loam, silty clay loam, loam.	CL-ML, CL	A-4, A-6	0	95-100	90-100	80-100	60-100	25-40	5-15
SC*: Saleratus Variant--------	0-3	Loamy fine sand	SM	A-2	0	100	95-100	75-80	20-35	---	NP
	3-30	Fine sand, very fine sand.	SM	A-2, A-4	0-5	100	95-100	75-90	25-50	---	NP
	30-60	Gravelly fine sand, gravelly coarse sand.	SM, SP-SM	A-1, A-2	0-5	60-80	55-75	35-55	5-20	---	NP
Canburn Variant-	0-18	Loamy sand-------	SM	A-2	0	100	90-100	50-75	15-30	---	NP
	18-60	Loamy fine sand, loamy sand, gravelly loamy sand.	SM	A-2, A-1, A-4	0	75-100	70-100	35-80	10-40	---	NP
SDF---------- Sambrito	0-2	Sandy loam-------	SM	A-2, A-4	0	90-100	85-100	50-70	30-40	---	NP
	2-60	Sandy loam, loamy sand, fine sandy loam.	SM	A-2, A-4	0	80-100	75-100	50-70	15-40	---	NP
SEE---------- Scout	0-21	Very stony loam	GM-GC, SM-SC	A-2, A-4	25-50	40-75	35-70	30-60	25-50	15-25	5-10
	21-31	Very gravelly fine sandy loam, very cobbly sandy loam, very cobbly loam.	GM, SM	A-2, A-1	20-70	50-75	45-60	30-55	15-35	15-25	NP-5
	31-60	Very gravelly sandy loam, extremely cobbly fine sandy loam, very cobbly fine sandy loam.	GM, SM	A-2, A-1	20-80	45-75	40-60	25-45	15-30	15-25	NP-5
SFD---------- Searla	0-8	Very gravelly silt loam.	GM-GC	A-2	0-5	35-45	30-40	25-40	20-35	20-30	5-10
	8-24	Extremely gravelly silty clay loam.	GC	A-2	5-15	25-45	20-40	20-35	15-30	30-40	10-20
	24-41	Very gravelly silt loam.	GM-GC	A-2	0	30-45	25-40	25-35	20-35	25-35	5-10
	41	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 13.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
SGF---------- Slinger	0-5	Gravelly loam----	GM, SM, GM-GC, SM-SC	A-4	0-5	60-80	55-75	55-65	40-50	20-30	NP-10
	5-14	Gravelly loam----	GM-GC, SM-SC	A-4	0-5	60-75	55-70	55-60	40-50	20-30	5-10
	14-23	Very gravelly loam, very cobbly loam.	GM-GC	A-2, A-4	0-45	50-55	45-50	40-50	30-40	20-30	5-10
	23	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
SHF---------- Solak	0-5	Gravelly loam----	GM-GC, SM-SC	A-4	0-5	65-75	60-70	50-65	35-50	20-30	5-10
	5-15	Very gravelly loam, extremely gravelly loam, extremely cobbly sandy loam.	GM-GC	A-2, A-4	5-45	30-65	20-55	20-45	15-40	20-30	5-10
	15	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
SJF---------- Solak	0-5	Gravelly loam----	GM-GC, SM-SC	A-4	0-5	65-75	60-70	50-65	35-50	20-30	5-10
	5-12	Very gravelly loam, extremely gravelly loam, extremely cobbly sandy loam.	GM-GC	A-2, A-4	5-45	30-65	20-55	20-45	15-40	20-30	5-10
	12	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
SKF*: Solak----------	0-4	Very cobbly loam	GM-GC	A-2, A-4	35-50	45-65	40-60	35-50	25-40	20-30	5-10
	4-15	Very gravelly loam, extremely gravelly loam, extremely cobbly sandy loam.	GM-GC	A-2, A-4	5-45	30-65	20-55	20-45	15-40	20-30	5-10
	15	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Ranruff---------	0-5	Gravelly loam----	GM-GC, SM-SC	A-4	0-5	60-80	55-75	50-65	40-50	25-30	5-10
	5-16	Gravelly loam----	GM-GC, SM-SC	A-4	0-10	55-75	50-70	40-60	35-45	25-30	5-10
	16	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
SLE---------- St. Marys	0-10	Loam----------	CL-ML, CL	A-4	0-5	80-100	75-100	60-95	50-75	15-25	5-10
	10-45	Very cobbly fine sandy loam, extremely cobbly loam, gravelly fine sandy loam.	GM, SM	A-2, A-4	25-75	55-70	50-65	40-60	25-50	15-25	NP-5
	45	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
SME*: St. Marys-------	0-10	Loam----------	CL-ML, CL	A-4	0-5	80-100	75-100	60-95	50-75	15-25	5-10
	10-45	Very cobbly fine sandy loam, extremely cobbly loam, gravelly fine sandy loam.	GM, SM	A-2, A-4	25-75	55-70	50-65	40-60	25-50	15-25	NP-5
	45	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 13.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
SME*:											
Yeljack	0-14	Loam	CL-ML, CL	A-4	0	95-100	90-100	75-95	55-75	20-30	5-10
	14-32	Loam, very fine sandy loam, fine sandy loam.	CL, CL-ML, SC, SM-SC	A-4	0	85-100	80-100	65-95	40-75	20-30	5-10
	32-60	Clay loam, sandy clay loam, cobbly clay loam.	CL, SC	A-6	0-25	85-100	80-100	70-100	35-80	30-40	10-20
SNF	0-8	Stony loam	CL-ML	A-4	10-20	70-90	65-85	60-75	50-65	25-35	5-10
Sumine	8-22	Very gravelly clay loam, very cobbly clay loam, extremely cobbly loam.	CL, SC, GC	A-6, A-7	30-75	70-80	65-75	55-70	40-65	30-45	10-20
	22-28	Extremely cobbly sandy loam, very gravelly loam.	GM, GM-GC	A-1, A-2	30-50	25-40	20-35	10-30	10-15	20-30	NP-10
	28	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
TAB	0-13	Silt loam	CL-ML, ML	A-4	0	95-100	90-100	90-100	70-90	25-35	5-10
Thatcher	13-31	Silty clay loam, clay loam.	CL	A-6	0	95-100	95-100	95-100	85-95	25-35	10-15
	31-60	Silt loam, fine sandy loam, loam.	CL-ML, SM-SC	A-4	0	95-100	90-100	70-100	45-90	20-30	5-10
TAD	0-11	Silt loam	CL-ML, ML	A-4	0	95-100	90-100	90-100	70-90	25-35	5-10
Thatcher	11-38	Silty clay loam, clay loam.	CL	A-6	0	95-100	95-100	95-100	85-95	25-35	10-15
	38-60	Silt loam, fine sandy loam, loam.	CL-ML, SM-SC	A-4	0	95-100	90-100	70-100	45-90	20-30	5-10
TAE	0-10	Silt loam	CL-ML, ML	A-4	0	95-100	90-100	90-100	70-90	25-35	5-10
Thatcher	10-35	Silty clay loam, clay loam, silt loam.	CL, CL-ML	A-6, A-4	0	95-100	95-100	90-100	85-95	25-35	5-15
	35-60	Silt loam, fine sandy loam, loam.	CL-ML, SM-SC	A-4	0	95-100	90-100	70-100	45-90	20-30	5-10
TBA	0-11	Silt loam	CL-ML, ML	A-4	0	95-100	90-100	90-100	70-90	25-35	5-10
Thatcher	11-34	Silty clay loam, clay loam.	CL	A-6	0	95-100	95-100	95-100	85-95	25-35	10-15
	34-60	Gravelly loam, very gravelly loam.	GM-GC, SM-SC	A-4, A-2	0-5	50-80	45-75	40-65	30-50	20-30	5-10
TBB	0-13	Silt loam	CL-ML, ML	A-4	0	95-100	90-100	90-100	70-90	25-35	5-10
Thatcher	13-44	Silty clay loam, clay loam.	CL	A-6	0	95-100	95-100	95-100	85-95	25-35	10-15
	44-60	Gravelly loam, very gravelly loam.	GM-GC, SM-SC	A-4, A-2	0-5	50-80	45-75	40-65	30-50	20-30	5-10
TBC	0-12	Silt loam	CL-ML, ML	A-4	0	95-100	90-100	90-100	70-90	25-35	5-10
Thatcher	12-29	Silty clay loam, clay loam.	CL	A-6	0	95-100	95-100	95-100	85-95	25-35	10-15
	29-60	Silt loam, silty clay loam.	CL-ML, CL	A-4, A-6	0	95-100	90-100	85-100	85-95	25-35	5-15

See footnote at end of table.

TABLE 13.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
TBD----------	0-10	Silt loam--------	CL-ML, ML	A-4	0	95-100	90-100	90-100	70-90	25-35	5-10
Thatcher	10-22	Silty clay loam, clay loam.	CL	A-6	0	95-100	95-100	95-100	85-95	25-35	10-15
	22-60	Silt loam, silty clay loam.	CL-ML, CL	A-4, A-6	0	95-100	90-100	85-100	85-95	25-35	5-15
VAE----------	0-7	Loam----------	CL-ML	A-4	0-5	85-100	80-100	65-95	50-75	20-30	5-10
Vanni	7-60	Loam, silt loam	CL-ML, ML	A-4	0-5	90-100	85-100	70-90	55-85	25-35	5-10
VAF----------	0-7	Loam----------	CL-ML	A-4	0-5	85-100	80-100	65-95	50-75	20-30	5-10
Vanni	7-60	Loam, silt loam	CL-ML, ML	A-4	0-5	90-100	85-100	70-90	55-85	25-35	5-10
VBF----------	0-7	Very stony loam	GM-GC, SM-SC	A-4	25-45	55-75	50-70	45-60	35-50	25-30	5-10
Vanni	7-60	Gravelly loam, gravelly silt loam.	GM-GC, CL-ML, SM-SC	A-4	0-5	70-85	65-80	55-70	40-60	20-30	5-10
VCD----------	0-5	Silt loam--------	CL-ML, CL	A-4, A-6	0	90-95	85-90	75-90	60-80	25-35	5-15
Vicking	5-24	Silty clay loam, gravelly silty clay loam.	CL	A-6	0-5	70-90	65-85	60-80	55-75	25-40	10-20
	24-60	Gravelly loam, very gravelly loam.	SC, GM-GC, GC, SM-SC	A-2, A-4, A-6	0-5	40-70	35-65	30-60	25-50	25-35	5-15
WA----------	0-7	Loam----------	CL-ML	A-4	0	100	100	85-95	60-75	25-30	5-10
Wader	7-19	Silt loam, loam	CL-ML	A-4	0	100	100	85-100	60-90	20-30	5-10
	19-36	Fine sandy loam	SM	A-4	0	100	100	70-85	40-50	20-25	NP-5
	36-60	Coarse sand, sand	SM, SP-SM	A-2, A-1	0	90-100	85-100	45-70	5-15	---	NP
WB----------	0-11	Loam----------	CL-ML	A-4	0	100	100	85-95	60-75	25-30	5-10
Wader	11-46	Silt loam, loam	CL-ML	A-4	0	100	100	85-100	60-90	20-30	5-10
	46-60	Coarse sand, sand	SM, SP-SM	A-2, A-1	0	90-100	85-100	45-70	5-15	---	NP
WC----------	0-8	Gravelly loam----	GM-GC, SM-SC	A-4	0	65-75	55-70	50-60	35-50	20-30	5-10
Wader Variant	8-60	Very gravelly loamy sand, very gravelly sandy loam.	GW-GM, GP-GM	A-1	0-5	35-45	30-40	15-25	5-10	---	NP
WDC----------	0-11	Loam----------	CL-ML	A-4	0	90-100	85-100	75-95	55-75	25-30	5-10
Woodpass	11-38	Loam, clay loam, silty clay loam.	CL, CL-ML	A-4, A-6	0-5	80-100	75-100	65-95	50-80	20-35	5-15
	38-60	Loam, silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0-5	80-100	75-100	65-100	50-95	20-35	5-15
YAE----------	0-10	Gravelly loam----	CL-ML	A-4	0-5	70-90	65-85	60-80	50-60	25-30	5-10
Yeates Hollow	10-52	Very cobbly clay, very gravelly clay loam, extremely cobbly clay.	GC	A-7, A-2	15-50	40-55	35-55	25-50	20-45	40-60	15-30
	52	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
YBD*:											
Yeates Hollow---	0-12	Stony loam-------	GM-GC, CL-ML	A-4	15-25	70-95	65-90	60-80	35-60	25-30	5-10
	12-59	Very gravelly clay loam.	GC	A-7, A-2	5-20	35-55	30-50	25-45	15-40	40-60	15-30
	59-72	Extremely gravelly loam.	GM-GC	A-2	5-20	25-35	20-30	15-25	10-20	25-30	5-10
Obray----------	0-8	Silty clay loam	CL	A-6	0	90-100	85-100	75-100	65-95	30-40	10-20
	8-57	Silty clay, clay	CL, CH	A-7	0	100	100	95-100	90-95	45-55	25-35
	57-60	Gravelly clay----	GC	A-7	0-10	60-70	55-65	50-60	40-50	40-55	20-35

See footnote at end of table.

TABLE 13.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
YCD----------	0-30	Loam----------	CL-ML, CL	A-4	0	95-100	90-100	75-95	55-75	20-30	5-10
Yeljack	30-60	Clay loam, sandy clay loam, cobbly clay loam.	CL, SC	A-6	0-25	85-100	80-100	70-100	35-80	30-40	10-20
YDE----------	0-26	Loam----------	CL-ML, CL	A-4	0	95-100	90-100	75-95	55-75	20-30	5-10
Yeljack	26-37	Loam, very fine sandy loam, fine sandy loam.	CL, CL-ML, SC, SM-SC	A-4	0	85-100	80-100	65-95	40-75	20-30	5-10
	37-60	Gravelly clay loam.	CL, GC, SC	A-6	0-10	65-80	60-75	45-75	35-55	30-40	10-20
YEE*:											
Yeljack---------	0-14	Loam----------	CL-ML, CL	A-4	0	95-100	90-100	75-95	55-75	20-30	5-10
	14-32	Loam, very fine sandy loam, fine sandy loam.	CL, CL-ML, SC, SM-SC	A-4	0	85-100	80-100	65-95	40-75	20-30	5-10
	32-60	Clay loam, sandy clay loam, cobbly clay loam.	CL, SC	A-6	0-25	85-100	80-100	70-100	35-80	30-40	10-20
Cluff----------	0-4	Gravelly loam----	GM-GC, CL-ML	A-4	20-30	65-75	60-70	50-65	40-55	20-30	5-10
	4-14	Very cobbly loam, very gravelly loam.	GM-GC	A-2, A-4	30-50	45-60	40-50	35-45	25-40	20-30	5-10
	14-40	Extremely gravelly sandy clay loam.	GC	A-2, A-7	20-40	20-50	15-30	15-25	10-20	40-50	15-25
	40	Weathered bedrock	---	---	---	---	---	---	---	---	---
ZAD*:											
Zagg----------	0-3	Gravelly clay loam.	CL, GC, SC	A-6	0	65-85	60-80	55-80	40-75	30-40	10-15
	3-60	Silty clay loam, silty clay, clay.	CL	A-6, A-7	0	95-100	90-100	90-100	75-95	35-50	15-25
Zagg----------	0-9	Clay loam--------	CL	A-6	0	100	95-100	90-100	70-95	30-40	10-15
	9-60	Clay loam, silty clay, clay.	CL	A-6, A-7	0	95-100	90-100	90-100	75-95	35-50	15-25
ZBC----------	0-8	Silty clay loam	CL	A-6	0	95-100	90-100	85-100	75-95	30-40	10-15
Zegro	8-37	Silty clay loam, silty clay.	CL	A-6, A-7	0	95-100	90-100	85-100	75-95	35-50	15-25
	37	Weathered bedrock	---	---	---	---	---	---	---	---	---
ZCD*:											
Zegro----------	0-8	Silty clay loam	CL	A-6	0	95-100	90-100	85-100	75-95	30-40	10-15
	8-37	Silty clay loam, silty clay.	CL	A-6, A-7	0	95-100	90-100	85-100	75-95	35-50	15-25
	37	Weathered bedrock	---	---	---	---	---	---	---	---	---
Zagg----------	0-3	Silty clay loam	CL	A-6	0	100	95-100	90-100	70-95	30-40	10-15
	3-60	Clay loam, silty clay, clay.	CL	A-6, A-7	0	95-100	90-100	90-100	75-95	35-50	15-25

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS

[The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated]

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
									K	T		
	In	Pct	G/cm³	In/hr	In/in	pH	Mmhos/cm					Pct
AAD*, AAF*:												
Agassiz	0-5	18-27	1.10-1.15	0.6-2.0	0.07-0.10	6.1-8.4	<2	Low	0.15	1	8	1-3
	5-12	20-30	1.15-1.25	0.6-2.0	0.07-0.10	6.1-8.4	<2	Low	0.15			
	12	---	---	---	---	---	---	---	---			
Mult	0-10	20-27	---	0.6-2.0	0.17-0.19	5.6-7.3	<2	Low	0.24	2	6	4-6
	10-38	25-35	---	0.02-0.6	0.16-0.18	5.6-7.8	<2	Moderate	0.32			
	38	---	---	---	---	---	---	---	---			
ABF*:												
Agassiz	0-6	18-27	1.10-1.15	0.6-2.0	0.10-0.14	6.1-8.4	<2	Low	0.17	1	8	1-3
	6-10	20-30	1.15-1.25	0.6-2.0	0.07-0.10	6.1-8.4	<2	Low	0.15			
	10	---	---	---	---	---	---	---	---			
Richville	0-12	18-24	1.25-1.35	0.6-2.0	0.12-0.15	7.9-9.0	<2	Moderate	0.37	3	5	1-3
	12-31	18-33	1.30-1.40	0.2-0.6	0.13-0.17	7.9-9.0	<2	Moderate	0.43			
	31	---	---	---	---	---	---	---	---			
ACF*:												
Agassiz	0-6	18-27	1.10-1.15	0.6-2.0	0.10-0.14	6.1-8.4	<2	Low	0.17	1	8	1-3
	6-10	20-30	1.15-1.25	0.6-2.0	0.07-0.10	6.1-8.4	<2	Low	0.15			
	10	---	---	---	---	---	---	---	---			
Rock outcrop.												
ADD	0-5	19-22	1.45-1.55	0.6-2.0	0.15-0.18	7.9-9.0	<2	Low	0.28	3	4L	2-3
Alhark	5-24	20-26	1.50-1.60	0.6-2.0	0.13-0.16	>8.4	<2	Low	0.32			
	24-42	18-20	1.50-1.60	2.0-6.0	0.11-0.15	>8.4	<2	Low	0.37			
	42	---	---	---	---	---	---	---	---			
ADE	0-12	19-22	1.45-1.55	0.6-2.0	0.15-0.18	7.9-9.0	<2	Low	0.28	3	4L	2-3
Alhark	12-46	20-26	1.50-1.60	0.6-2.0	0.13-0.16	>8.4	<2	Low	0.32			
	46	---	---	---	---	---	---	---	---			
AEC	0-7	16-24	1.45-1.55	0.6-2.0	0.16-0.18	7.9-9.0	<2	Low	0.37	5	4L	1-2
Alhark	7-24	18-27	1.45-1.55	0.6-2.0	0.15-0.18	8.5-9.0	<2	Low	0.49			
	24-60	18-32	1.40-1.50	0.6-2.0	0.15-0.18	>8.4	<2	Low	0.49			
AFD	0-12	18-24	1.10-1.15	0.6-2.0	0.16-0.20	6.1-7.3	<2	Moderate	0.24	3	6	1-3
Ant Flat	12-47	35-55	1.15-1.25	0.06-0.2	0.14-0.20	6.1-8.4	<2	High	0.32			
	47-60	35-50	1.15-1.25	0.06-0.2	0.14-0.20	6.1-8.4	<2	High	0.37			
BAD	0-19	20-25	1.20-1.30	0.6-2.0	0.15-0.17	6.1-6.5	<2	Low	0.20	3	5	3-5
Baird Hollow	19-26	35-40	1.20-1.35	0.2-0.6	0.11-0.13	5.6-6.0	<2	Moderate	0.20			
	26-60	35-55	1.25-1.35	0.06-0.2	0.08-0.11	4.5-5.5	<2	Moderate	0.20			
BB	0-16	18-26	1.35-1.45	0.2-0.6	0.17-0.18	7.9-8.4	<2	Low	0.32	2	8	3-4
Bear Lake	16-47	18-32	1.35-1.45	0.06-0.2	0.17-0.18	7.9-9.0	2-4	Low	0.10			
	47-60	3-8	1.60-1.70	>20.0	0.03-0.05	7.9-8.4	<2	Low	0.32			
BC	0-8	18-26	1.35-1.45	0.2-0.6	0.17-0.18	7.9-8.4	<2	Low	0.32	2	8	3-4
Bear Lake	8-60	18-32	1.35-1.45	0.06-0.2	0.17-0.18	7.9-9.0	2-4	Low	0.10			
BD	0-16	28-34	1.35-1.45	0.06-0.2	0.13-0.16	8.5-9.0	4-8	Moderate	0.43	2	---	3-4
Bear Lake	16-60	18-32	1.35-1.45	0.06-0.2	0.17-0.18	7.9-9.0	2-4	Low	0.10			
BEF	0-5	15-25	1.50-1.60	0.6-2.0	0.09-0.11	7.4-9.0	<2	Low	0.24	2	8	1-3
Bequinn	5-26	10-22	1.50-1.60	0.6-2.0	0.05-0.09	7.4-9.0	<2	Low	0.15			
	26-60	2-5	1.50-1.60	>20	0.02-0.04	7.4-9.0	<2	Low	0.10			

See footnote at end of table.

TABLE 14.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
									K	T		
	In	Pct	G/cm³	In/hr	In/in	pH	Mmhos/cm					Pct
BFB	0-8	20-30	1.35-1.50	0.2-0.6	0.15-0.17	7.9-8.4	2-4	Low	0.43	5	4L	.5-1
Bereniceton	8-60	18-30	1.40-1.50	0.2-0.6	0.14-0.18	7.9-9.0	2-4	Low	0.37			
BGE	0-6	16-22	1.45-1.55	0.6-2.0	0.11-0.14	7.9-8.4	2-4	Low	0.32	---	8	.5-1
Bereniceton	6-60	18-30	1.40-1.50	0.2-0.6	0.14-0.18	7.9-9.0	2-4	Low	0.37			
BHA	0-8	18-25	---	0.6-2.0	0.16-0.18	7.9-8.4	<2	Low	0.32	3	4L	3
Bockston	8-24	18-27	---	0.6-2.0	0.15-0.18	7.9-8.4	<2	Low	0.43			
	24-40	14-19	---	2.0-6.0	0.08-0.11	>8.4	2-4	Low	0.28			
	40-60	3-14	---	6.0-20.0	0.04-0.07	7.9-9.0	<2	Low	0.24			
BHB	0-7	18-25	---	0.6-2.0	0.16-0.18	7.9-8.4	<2	Low	0.32	3	4L	3
Bockston	7-43	18-27	---	0.6-2.0	0.15-0.18	7.9-8.4	<2	Low	0.43			
	43-60	14-19	---	2.0-6.0	0.08-0.11	>8.4	2-4	Low	0.28			
BJC	0-11	13-20	1.20-1.35	0.6-2.0	0.13-0.17	6.1-7.8	<2	Low	0.24	2	5	1-3
Bullnel	11-35	20-33	1.25-1.35	0.2-0.6	0.12-0.15	6.1-8.4	<2	Moderate	0.37			
	35-39	20-33	1.25-1.35	0.6-2.0	0.10-0.12	6.1-8.4	<2	Low	0.37			
	39	---	---	---	---	---	---	---	---			
BJE	0-12	13-20	1.20-1.35	0.6-2.0	0.13-0.17	6.1-7.8	<2	Low	0.24	2	5	1-3
Bullnel	12-31	20-33	1.25-1.35	0.2-0.6	0.12-0.15	6.1-8.4	<2	Moderate	0.37			
	31-39	20-33	1.25-1.35	0.6-2.0	0.10-0.12	6.1-8.4	<2	Low	0.37			
	39	---	---	---	---	---	---	---	---			
CA	0-24	15-27	---	0.2-0.6	0.17-0.20	7.4-9.0	<2	Moderate	0.24	5	8	2-5
Canburn	24-60	18-30	---	0.2-0.6	0.13-0.18	7.4-9.0	<2	Moderate	0.32			
CBD*:												
Cloud Rim	0-13	20-27	1.25-1.35	0.6-2.0	0.17-0.19	6.1-7.3	<2	Low	0.28	5	5	2-5
	13-70	25-33	1.20-1.30	0.2-0.6	0.17-0.18	6.1-7.3	<2	Low	0.37			
McCarey	0-10	18-27	---	0.6-2.0	0.16-0.18	6.6-7.3	<2	Low	0.32	2	6	1-3
	10-22	28-35	---	0.2-0.6	0.16-0.18	6.6-7.8	<2	Moderate	0.28			
	22-29	12-20	---	2.0-6.0	0.09-0.11	7.4-7.8	<2	Low	0.24			
	29	---	---	---	---	---	---	---	---			
CCE	0-14	18-24	---	0.6-2.0	0.10-0.12	5.6-6.5	<2	Low	0.28	2	8	2-5
Cluff	14-41	35-50	---	0.06-0.2	0.06-0.08	4.5-6.0	<2	Moderate	0.28			
	41	---	---	---	---	---	---	---	---			
CDD	0-4	18-22	1.40-1.50	0.6-2.0	0.11-0.14	5.6-7.3	<2	Low	0.15	2	8	1-3
Condie	4-31	18-33	1.35-1.45	0.2-0.6	0.08-0.12	5.6-6.5	<2	Low	0.28			
	31-60	18-20	1.40-1.50	0.6-6.0	0.06-0.08	6.6-7.3	<2	Low	0.24			
CDE	0-5	18-22	1.40-1.50	0.6-2.0	0.11-0.14	5.6-7.3	<2	Low	0.15	2	8	1-3
Condie	5-20	28-33	1.35-1.45	0.2-0.6	0.08-0.12	5.6-6.5	<2	Low	0.28			
	20-49	18-30	1.40-1.50	0.6-6.0	0.06-0.08	6.6-7.3	<2	Low	0.24			
	49-60	18-34	1.35-1.45	0.2-0.6	0.08-0.12	5.6-6.5	<2	Low	0.24			
CEA	0-8	15-24	1.35-1.45	0.6-2.0	0.16-0.18	>7.8	<2	Low	0.43	5	4L	2-5
Cowco	8-60	20-30	1.35-1.45	0.06-0.2	0.17-0.18	>7.8	<2	Moderate	0.43			
CEB	0-9	15-24	1.35-1.45	0.6-2.0	0.16-0.18	>7.8	<2	Low	0.43	5	4L	2-5
Cowco	9-60	20-30	1.35-1.45	0.06-0.2	0.17-0.18	>7.8	<2	Moderate	0.43			
CFA	0-6	28-32	1.35-1.45	0.06-0.2	0.13-0.15	>7.8	4-8	Moderate	0.37	1	4L	2-5
Cowco	6-38	20-30	1.35-1.45	0.06-0.2	0.17-0.18	>7.8	4-18	Moderate	0.43			
	38-60	25-35	1.35-1.45	0.06-0.6	0.11-0.15	>7.8	4-16	Moderate	0.49			
CGD	0-9	12-17	1.30-1.40	0.6-2.0	0.12-0.14	7.4-9.0	<2	Low	0.17	2	8	2-5
Cutoff	9-22	14-17	1.30-1.40	0.6-2.0	0.10-0.14	7.9-9.0	<2	Low	0.32			
	22-26	10-16	1.30-1.40	2.0-6.0	0.07-0.11	>7.8	<2	Low	0.28			
	26	---	---	---	---	---	---	---	---			

See footnote at end of table.

TABLE 14.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
									K	T		
	In	Pct	G/cm³	In/hr	In/in	pH	Mmhos/cm					Pct
CGF	0-5	12-17	1.30-1.40	0.6-2.0	0.12-0.14	7.4-9.0	<2	Low	0.17	2	8	2-5
Cutoff	5-13	14-17	1.30-1.40	0.6-2.0	0.10-0.14	7.9-9.0	<2	Low	0.32			
	13-35	10-16	1.30-1.40	2.0-6.0	0.07-0.11	>7.8	<2	Low	0.28			
	35	---	---	---	---	---	---	---	---			
CHF*:												
Cutoff	0-5	12-17	1.30-1.40	0.6-2.0	0.12-0.14	7.4-9.0	<2	Low	0.17	2	8	2-5
	5-11	14-17	1.30-1.40	0.6-2.0	0.10-0.14	7.9-9.0	<2	Low	0.32			
	11-39	10-16	1.30-1.40	2.0-6.0	0.07-0.11	>7.8	<2	Low	0.28			
	39	---	---	---	---	---	---	---	---			
Falula	0-5	12-18	1.30-1.40	0.6-2.0	0.08-0.11	6.6-8.4	<2	Low	0.15	1	6	2-4
	5-18	10-18	1.30-1.40	0.6-2.0	0.07-0.09	7.4-9.0	<2	Low	0.20			
	18	---	---	---	---	---	---	---	---			
DAF	0-15	18-26	1.45-1.55	0.6-2.0	0.09-0.13	7.4-8.4	<2	Low	0.24	1	8	2-5
Dagan	15-22	18-25	1.50-1.60	0.6-2.0	0.07-0.11	7.9-9.0	<2	Low	0.28			
	22-50	10-22	1.50-1.60	2.0-6.0	0.04-0.10	7.9-9.0	<2	Low	0.32			
	50	---	---	---	---	---	---	---	---			
DBF	0-12	18-25	1.50-1.60	0.6-2.0	0.08-0.09	7.4-8.4	<2	Low	0.17	1	8	2-5
Dagan	12-29	18-25	1.50-1.60	0.6-2.0	0.07-0.11	7.9-9.0	<2	Low	0.28			
	29-50	10-22	1.50-1.60	2.0-6.0	0.04-0.10	7.9-9.0	<2	Low	0.32			
	50	---	---	---	---	---	---	---	---			
DCF	0-15	18-26	1.30-1.40	0.6-2.0	0.09-0.13	7.4-8.4	<2	Low	0.24	1	8	2-5
Dagan	15-28	18-25	1.50-1.65	0.6-2.0	0.07-0.11	7.9-9.0	<2	Low	0.28			
	28-60	10-22	1.50-1.65	2.0-6.0	0.04-0.10	7.9-9.0	<2	Low	0.32			
DDF*:												
Dagan	0-10	18-25	1.50-1.60	0.6-2.0	0.08-0.09	7.4-8.4	<2	Low	0.17	1	8	2-5
	10-28	18-25	1.50-1.60	0.6-2.0	0.07-0.11	7.9-9.0	<2	Low	0.28			
	28-41	10-22	1.50-1.60	2.0-6.0	0.04-0.10	7.9-9.0	<2	Low	0.32			
	41	---	---	---	---	---	---	---	---			
Rubble Land.												
DEE	0-15	15-20	1.40-1.50	0.6-2.0	0.14-0.16	6.6-8.4	<2	Low	0.28	1	4L	2-4
Dennot	15-20	15-25	1.50-1.60	0.6-2.0	0.08-0.11	7.9-9.0	<2	Low	0.28			
	20-50	10-15	1.50-1.60	2.0-6.0	0.05-0.07	7.9-9.0	<2	Low	0.24			
	50	---	---	---	---	---	---	---	---			
DFC	0-7	15-20	1.30-1.40	0.6-2.0	0.08-0.11	6.6-8.4	<2	Low	0.20	1	8	2-4
Dennot	7-28	15-25	1.30-1.40	0.6-2.0	0.08-0.11	7.9-9.0	<2	Low	0.28			
	28-60	10-15	1.35-1.50	2.0-6.0	0.05-0.07	7.9-9.0	<2	Low	0.24			
DGF	0-16	20-25	1.35-1.45	0.6-2.0	0.13-0.15	6.1-7.3	<2	Low	0.24	4	8	4-6
Despain	16-40	20-30	1.35-1.45	0.6-2.0	0.10-0.14	6.6-8.4	<2	Moderate	0.20			
	40-60	20-25	1.35-1.45	0.6-2.0	0.12-0.14	6.6-8.4	<2	Low	0.20			
DHB	0-18	20-25	1.30-1.40	0.6-2.0	0.12-0.13	7.9-8.4	<2	Low	0.15	3	8	1-3
Despain Variant	18-37	22-27	1.30-1.40	0.6-2.0	0.09-0.13	7.9-9.0	<2	Low	0.17			
	37-60	15-25	1.30-1.40	0.6-2.0	0.04-0.08	7.9-9.0	<2	Low	0.10			
DJA	0-14	15-20	1.30-1.40	0.6-2.0	0.14-0.16	7.9-9.0	<2	Low	0.32	1	4L	2-5
Duckree	14-32	11-18	1.35-1.45	2.0-6.0	0.05-0.11	>7.8	<2	Low	0.17			
	32-60	3-8	1.45-1.55	>20	0.03-0.05	>7.8	<2	Low	0.10			
DKD	0-2	10-18	1.30-1.40	2.0-6.0	0.09-0.15	7.9-9.0	<2	Low	0.20	1	8	2-5
Duckree	2-60	11-18	1.35-1.45	2.0-6.0	0.05-0.11	>7.8	<2	Low	0.17			
DLE	0-6	10-18	1.30-1.40	2.0-6.0	0.09-0.15	7.9-9.0	<2	Low	0.20	1	8	2-5
Duckree	6-28	11-18	1.35-1.45	2.0-6.0	0.05-0.11	>7.8	<2	Low	0.17			
	28-60	3-8	1.45-1.55	>20	0.03-0.05	>7.8	<2	Low	0.10			

See footnote at end of table.

TABLE 14.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
									K	T		
	In	Pct	G/cm³	In/hr	In/in	pH	Mmhos/cm					Pct
DMF*:												
Duckree	0-5	10-18	1.30-1.40	2.0-6.0	0.09-0.15	7.9-9.0	<2	Low	0.20	1	8	2-5
	5-60	11-18	1.35-1.45	2.0-6.0	0.05-0.11	>7.8	<2	Low	0.17			
St. Marys	0-17	12-17	1.45-1.60	0.6-2.0	0.07-0.11	6.1-7.3	<2	Low	0.24	1	8	1-3
	17-25	10-16	1.50-1.65	0.6-6.0	0.05-0.08	6.1-7.8	<2	Low	0.17			
	25-50	10-16	1.50-1.65	0.6-6.0	0.05-0.08	6.1-7.8	<2	Low	0.17			
	50	---	---	---	---	---	---	---	---			
EAC	0-3	15-22	1.35-1.45	0.6-2.0	0.16-0.18	7.9-9.0	<2	Low	0.43	1	4L	1-2
Ellett	3-14	18-27	1.35-1.45	0.2-0.6	0.10-0.18	7.9-9.0	<4	Low	0.43			
	14	---	---	---	---	---	---	---	---			
EAE	0-4	15-22	1.35-1.45	0.6-2.0	0.16-0.18	7.9-9.0	<2	Low	0.43	1	4L	1-2
Ellett	4-14	18-27	1.35-1.45	0.2-0.6	0.10-0.18	7.9-9.0	<4	Low	0.43			
	14	---	---	---	---	---	---	---	---			
EBD	0-16	18-27	---	0.6-2.0	0.15-0.17	6.1-6.5	<2	Low	0.24	4	6	2-5
Ercan	16-28	15-32	---	0.6-2.0	0.07-0.17	5.6-6.5	<2	Low	0.32			
	28-57	28-35	---	0.2-0.6	0.10-0.17	5.6-6.5	<2	Moderate	0.37			
	57	---	---	---	---	---	---	---	---			
EBE	0-19	18-27	---	0.6-2.0	0.15-0.17	6.1-6.5	<2	Low	0.24	4	6	2-5
Ercan	19-40	15-32	---	0.6-2.0	0.07-0.17	5.6-6.5	<2	Low	0.32			
	40-60	28-35	---	0.2-0.6	0.10-0.17	5.6-6.5	<2	Moderate	0.37			
ECE	0-4	18-27	1.25-1.35	0.6-2.0	0.06-0.10	6.6-8.4	<2	Low	0.20	2	8	2-6
Etchen	4-29	25-35	1.30-1.40	0.2-2.0	0.05-0.08	6.6-8.4	<2	Low	0.17			
	29	---	---	---	---	---	---	---	---			
FAE	0-10	12-18	1.30-1.40	0.6-2.0	0.08-0.11	6.6-8.4	<2	Low	0.15	1	6	2-4
Falula	10-17	10-18	1.30-1.40	0.6-2.0	0.07-0.09	7.4-9.0	<2	Low	0.20			
	17	---	---	---	---	---	---	---	---			
FBC	0-7	12-18	1.30-1.40	0.6-2.0	0.11-0.16	6.6-8.4	<2	Low	0.28	1	5	2-4
Falula	7-16	10-18	1.30-1.40	0.6-2.0	0.07-0.09	7.4-9.0	<2	Low	0.20			
	16	---	---	---	---	---	---	---	---			
FCE*:												
Falula	0-10	12-18	1.30-1.40	0.6-2.0	0.11-0.16	6.6-8.4	<2	Low	0.28	1	5	2-4
	10-18	10-18	1.30-1.40	0.6-2.0	0.07-0.09	7.4-9.0	<2	Low	0.20			
	18	---	---	---	---	---	---	---	---			
Kearl	0-11	12-18	1.20-1.30	0.6-2.0	0.14-0.18	6.6-8.4	<2	Low	0.28	2	3	2-5
	11-25	10-18	1.20-1.30	0.6-2.0	0.09-0.16	7.4-9.0	<2	Low	0.37			
	25	---	---	---	---	---	---	---	---			
FDF	0-25	18-22	1.30-1.40	0.6-2.0	0.10-0.14	5.6-6.5	<2	Low	0.24	2	8	1-3
Flygare	25-37	20-32	1.30-1.40	0.6-2.0	0.04-0.10	5.6-6.5	<2	Low	0.28			
	37-60	20-32	1.30-1.40	0.6-2.0	0.06-0.10	5.1-6.5	<2	Low	0.24			
FEE*:												
Fontreen	0-14	15-20	1.20-1.30	2.0-6.0	0.10-0.12	7.9-8.4	<2	Low	0.20	1	8	2-5
	14-60	15-20	1.20-1.30	2.0-6.0	0.07-0.10	7.9-9.0	<2	Low	0.17			
Rexmont	0-3	18-22	1.45-1.55	0.6-2.0	0.09-0.11	7.9-8.4	<2	Low	0.28	1	6	2-4
	3-10	18-22	1.50-1.60	0.6-2.0	0.08-0.09	7.9-9.0	<2	Low	0.28			
	10	---	---	---	---	---	---	---	---			
FFF	0-7	22-27	---	0.6-2.0	0.07-0.10	5.6-6.5	<2	Low	0.17	1	8	1-3
Foxol	7-16	22-27	---	0.6-2.0	0.07-0.10	5.6-6.5	<2	Low	0.17			
	16	---	---	---	---	---	---	---	---			
FGE	0-10	22-27	---	0.6-2.0	0.07-0.10	5.6-6.5	<2	Low	0.17	1	8	1-3
Foxol	10-15	22-27	---	0.6-2.0	0.07-0.10	5.6-6.5	<2	Low	0.17			
	15	---	---	---	---	---	---	---	---			

See footnote at end of table.

TABLE 14.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
									K	T		
	In	Pct	G/cm³	In/hr	In/in	pH	Mmhos/cm					Pct
GAD----------	0-7	14-22	1.40-1.50	0.06-0.2	0.15-0.17	7.9-8.4	<2	Low--------	0.43	5	4L	2-4
Gobine	7-48	18-25	1.40-1.50	0.06-0.2	0.15-0.17	7.9-9.0	<2	Low--------	0.55			
	48-60	15-25	1.40-1.50	0.06-2.0	0.12-0.17	7.9-9.0	<2	Low--------	0.49			
GBE*:												
Gridge----------	0-6	18-23	1.45-1.55	0.6-2.0	0.12-0.13	7.9-9.0	<2	Low--------	0.17	1	8	1-3
	6-17	18-23	1.45-1.55	0.6-2.0	0.16-0.18	7.9-9.0	<2	Low--------	0.43			
	17	---	---	---	---	---	---	----------	----			
Rock outcrop.												
GCE----------	0-11	22-27	---	0.6-2.0	0.15-0.18	6.1-7.3	<2	Low--------	0.24	5	6	3-8
Guilder	11-34	35-45	---	0.06-0.2	0.17-0.18	6.1-8.4	<2	Moderate	0.32			
	34-54	20-35	---	0.2-0.6	0.15-0.18	7.9-8.4	<2	Moderate	0.43			
	54	---	---	---	---	---	---	----------	----			
HAB----------	0-24	18-25	1.20-1.25	0.6-2.0	0.15-0.18	5.6-7.3	<2	Low--------	0.24	5	6	1-3
Hades	24-52	22-33	1.20-1.25	0.2-0.6	0.15-0.18	5.6-8.4	<2	Moderate	0.37			
	52-60	18-22	1.25-1.35	0.6-2.0	0.09-0.11	5.6-8.4	<2	Low--------	0.15			
HBD----------	0-10	30-35	1.25-1.35	0.06-0.2	0.16-0.18	5.6-7.8	<2	High-------	0.20	5	5	2-5
Hawkins	10-60	35-50	1.20-1.30	0.06-0.2	0.15-0.18	6.6-9.0	<2	High-------	0.28			
HC----------	0-5	28-32	1.30-1.40	0.06-0.2	0.18-0.19	7.9-9.0	<2	Moderate	0.43	5	8	1-3
Hival	5-32	50-60	1.30-1.40	<0.06	0.17-0.18	7.9-9.0	<2	High-------	0.20			
	32-60	40-60	1.25-1.35	<0.06	0.17-0.18	7.9-9.0	<2	High-------	0.20			
HDC----------	0-11	16-20	1.25-1.35	0.6-2.0	0.11-0.13	6.6-7.3	<2	Low--------	0.17	1	8	1-3
Horrocks	11-24	28-34	1.30-1.40	0.6-2.0	0.07-0.09	6.1-6.5	<2	Low--------	0.24			
	24-41	10-15	1.35-1.45	2.0-6.0	0.07-0.09	6.1-6.5	<2	Low--------	0.17			
	41	---	---	---	---	---	---	----------	----			
HEF----------	0-13	20-25	---	0.6-2.0	0.16-0.18	5.6-6.5	<2	Low--------	0.28	2	6	5-7
Hourglass	13-25	27-35	---	0.2-0.6	0.12-0.15	6.1-7.8	<2	Moderate	0.32			
	25-41	20-25	---	0.6-2.0	0.10-0.14	6.1-7.8	<2	Low--------	0.32			
	41	---	---	---	---	---	---	----------	----			
JAE----------	0-11	15-22	1.25-1.35	0.6-2.0	0.09-0.11	6.6-8.4	<2	Low--------	0.17	3	8	2-5
Jebo	11-18	15-22	1.25-1.35	0.6-2.0	0.08-0.11	6.6-8.4	<2	Low--------	0.28			
	18-26	10-20	1.30-1.40	0.6-2.0	0.05-0.11	7.9-9.0	<2	Low--------	0.28			
	26	---	---	---	---	---	---	----------	----			
JAF----------	0-10	15-22	1.25-1.35	0.6-2.0	0.09-0.11	6.6-8.4	<2	Low--------	0.17	3	8	2-5
Jebo	10-16	15-22	1.25-1.35	0.6-2.0	0.08-0.11	6.6-8.4	<2	Low--------	0.28			
	16-24	10-20	1.30-1.40	0.6-2.0	0.05-0.11	7.9-9.0	<2	Low--------	0.28			
	24-35	10-20	1.35-1.45	2.0-6.0	0.05-0.11	7.9-9.0	<2	Low--------	0.28			
	35	---	---	---	---	---	---	----------	----			
KAF----------	0-13	10-20	1.20-1.35	0.6-2.0	0.15-0.17	6.6-7.3	<2	Low--------	0.28	2	5	2-4
Kamack	13-20	12-20	1.35-1.45	2.0-6.0	0.10-0.12	6.1-7.3	<2	Low--------	0.24			
	20-41	18-28	1.30-1.45	2.0-6.0	0.08-0.13	6.1-6.5	<2	Low--------	0.20			
	41	---	---	---	---	---	---	----------	----			
KBD----------	0-13	12-18	1.20-1.30	0.6-2.0	0.14-0.18	6.6-8.4	<2	Low--------	0.28	2	3	2-5
Kearl	13-19	10-18	1.20-1.30	2.0-6.0	0.09-0.16	7.4-9.0	<2	Low--------	0.37			
	19-36	10-18	1.25-1.35	0.6-2.0	0.09-0.16	7.9-9.0	<2	Low--------	0.37			
	36	---	---	---	---	---	---	----------	----			
KBE----------	0-13	12-18	1.20-1.30	0.6-2.0	0.14-0.18	6.6-8.4	<2	Low--------	0.28	2	3	2-5
Kearl	13-37	10-18	1.20-1.30	2.0-6.0	0.09-0.16	7.4-9.0	<2	Low--------	0.37			
	37	---	---	---	---	---	---	----------	----			
KBF----------	0-11	12-18	1.20-1.30	0.6-2.0	0.14-0.18	6.6-8.4	<2	Low--------	0.28	2	3	2-5
Kearl	11-35	10-18	1.20-1.30	2.0-6.0	0.09-0.16	7.4-9.0	<2	Low--------	0.37			
	35	---	---	---	---	---	---	----------	----			

See footnote at end of table.

TABLE 14.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
									K	T		
	In	Pct	G/cm³	In/hr	In/in	pH	Mmhos/cm					Pct
KCD*:												
Kearl	0-16	12-15	1.25-1.35	2.0-6.0	0.09-0.10	6.6-8.4	<2	Low	0.10	2	3	2-5
	16-21	10-18	1.20-1.30	2.0-6.0	0.09-0.16	7.4-9.0	<2	Low	0.37			
	21-28	10-18	1.25-1.35	0.6-2.0	0.09-0.16	7.9-9.0	<2	Low	0.37			
	28	---	---	---	---	---	---	---	---			
Richville	0-3	18-24	1.25-1.35	0.6-2.0	0.12-0.15	7.9-9.0	<2	Moderate	0.37	3	5	1-3
	3-24	18-33	1.30-1.40	0.2-0.6	0.13-0.17	7.9-9.0	<2	Moderate	0.43			
	24	---	---	---	---	---	---	---	---			
LAD	0-8	18-24	1.40-1.50	0.6-2.0	0.17-0.18	7.9-8.4	<2	Low	0.37	2	4L	1-3
Lakridge	8-14	18-24	1.40-1.50	0.6-2.0	0.17-0.18	7.9-8.4	<2	Low	0.49			
	14-27	20-26	1.40-1.50	0.6-2.0	0.14-0.16	7.9-8.4	<2	Low	0.43			
	27	---	---	---	---	---	---	---	---			
LBC	0-9	10-16	1.40-1.50	2.0-6.0	0.11-0.12	7.9-8.4	<2	Low	0.24	3	3	1-2
Lariat	9-32	10-18	1.40-1.50	2.0-6.0	0.08-0.17	8.5-9.0	<2	Low	0.32			
	32	---	---	---	---	---	---	---	---			
LCD	0-10	18-22	1.10-1.20	0.6-2.0	0.17-0.18	6.6-7.8	<2	Low	0.32	3	4L	1-3
Lonjon	10-16	18-24	1.10-1.20	0.6-2.0	0.12-0.14	7.4-7.8	<2	Low	0.32			
	16-30	18-20	1.20-1.30	0.6-2.0	0.06-0.08	7.9-9.0	<2	Low	0.28			
	30	---	---	---	---	---	---	---	---			
LCE	0-10	18-22	1.10-1.20	0.6-2.0	0.17-0.18	6.6-7.8	<2	Low	0.32	3	4L	1-3
Lonjon	10-16	18-24	1.10-1.20	0.6-2.0	0.12-0.14	7.4-7.8	<2	Low	0.32			
	16-27	18-20	1.20-1.30	0.6-2.0	0.06-0.08	7.9-9.0	<2	Low	0.28			
	27	---	---	---	---	---	---	---	---			
LDD	0-18	16-22	1.10-1.20	0.6-2.0	0.13-0.15	5.6-7.3	<2	Low	0.28	2	8	3-5
Lucky Star	18-40	18-25	1.10-1.20	0.6-2.0	0.05-0.09	5.6-7.3	<2	Low	0.28			
	40-60	24-32	1.20-1.35	0.6-2.0	0.07-0.09	5.6-7.3	<2	Low	0.17			
LDF	0-13	16-22	1.10-1.20	0.6-2.0	0.13-0.15	5.6-7.3	<2	Low	0.28	2	8	3-5
Lucky Star	13-40	18-24	1.10-1.20	0.6-2.0	0.07-0.09	5.6-7.3	<2	Low	0.20			
	40-60	24-32	1.20-1.35	0.6-2.0	0.07-0.09	5.6-7.3	<2	Low	0.17			
LEF*:												
Lucky Star	0-13	16-22	1.10-1.20	0.6-2.0	0.13-0.15	5.6-7.3	<2	Low	0.28	2	8	3-5
	13-40	18-24	1.10-1.20	0.6-2.0	0.07-0.09	5.6-7.3	<2	Low	0.20			
	40-60	24-32	1.20-1.35	0.6-2.0	0.07-0.09	5.6-7.3	<2	Low	0.17			
Condie	0-15	18-22	1.40-1.50	0.6-2.0	0.11-0.14	5.6-7.3	<2	Low	0.15	2	8	1-3
	15-60	28-34	1.35-1.45	0.2-0.6	0.08-0.12	5.6-6.5	<2	Low	0.24			
LFF*:												
Lundy	0-8	18-24	1.20-1.30	2.0-6.0	0.07-0.09	7.4-8.4	<2	Low	0.17	1	8	1-3
	8-16	20-33	1.20-1.30	0.6-2.0	0.07-0.11	7.4-8.4	<2	Low	0.24			
	16	---	---	---	---	---	---	---	---			
Rock outcrop.												
MAA	0-8	5-12	1.50-1.65	2.0-6.0	0.10-0.11	7.9-8.4	<2	Low	0.15	3	3	2
Matheson	8-38	5-12	1.50-1.65	2.0-6.0	0.09-0.10	7.9-8.4	<2	Low	0.28			
	38-60	2-4	1.60-1.70	>20	0.04-0.06	8.5-9.0	<2	Low	0.10			
MBE*:												
Mirror Lake	0-3	5-12	1.50-1.60	6.0-20	0.09-0.10	5.1-6.5	<2	Low	0.20	2	8	6-9
	3-11	0-5	1.50-1.60	6.0-20	0.05-0.07	4.5-5.5	<2	Low	0.17			
	11-60	2-8	1.50-1.60	>20	0.02-0.05	4.5-7.3	<2	Low	0.15			
Sambrito	0-4	5-10	---	2.0-6.0	0.09-0.11	6.1-6.5	<2	Low	0.28	5	3	.5-1
	4-60	5-10	---	6.0-20	0.07-0.09	5.6-7.3	<2	Low	0.17			
MCD*:												
Mult	0-10	20-27	---	0.6-2.0	0.17-0.19	5.6-7.3	<2	Low	0.24	2	6	4-6
	10-38	25-35	---	0.06-0.2	0.16-0.18	5.6-7.8	<2	Moderate	0.32			
	38	---	---	---	---	---	---	---	---			

See footnote at end of table.

TABLE 14.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
									K	T		
	In	Pct	G/cm3	In/hr	In/in	pH	Mmhos/cm					Pct
MCD*:												
Agassiz	0-5	18-27	1.10-1.15	0.6-2.0	0.07-0.10	6.1-8.4	<2	Low	0.15	1	8	1-3
	5-12	20-30	1.15-1.25	0.6-2.0	0.07-0.10	6.1-8.4	<2	Low	0.15			
	12	---	---	---	---	---	---	---	---			
MDC*:												
Murphy	0-4	30-35	1.20-1.30	0.2-0.6	0.15-0.18	7.9-8.4	<2	Moderate	0.28	5	6	1-3
	4-11	35-39	1.20-1.30	0.06-0.2	0.16-0.18	7.9-9.0	<2	Moderate	0.32			
	11-60	35-45	1.20-1.30	0.06-0.2	0.16-0.18	7.9-9.0	<2	Moderate	0.32			
Richville	0-3	18-24	1.25-1.35	0.6-2.0	0.12-0.15	7.9-9.0	<2	Moderate	0.37	3	5	1-3
	3-24	18-33	1.30-1.40	0.2-0.6	0.13-0.17	7.9-9.0	<2	Moderate	0.43			
	24	---	---	---	---	---	---	---	---			
MDE*:												
Murphy	0-10	30-35	1.20-1.30	0.2-0.6	0.15-0.18	7.9-8.4	<2	Moderate	0.28	5	6	1-3
	10-16	35-39	1.20-1.30	0.06-0.2	0.16-0.18	7.9-9.0	<2	Moderate	0.32			
	16-60	35-45	1.20-1.30	0.06-0.2	0.16-0.18	7.9-9.0	<2	Moderate	0.32			
Richville	0-3	18-24	1.25-1.35	0.6-2.0	0.12-0.15	7.9-9.0	<2	Moderate	0.37	3	5	1-3
	3-24	18-33	1.30-1.40	0.2-0.6	0.13-0.17	7.9-9.0	<2	Moderate	0.43			
	24	---	---	---	---	---	---	---	---			
NAD	0-6	12-17	1.45-1.55	2.0-6.0	0.09-0.12	7.9-8.4	<2	Low	0.24	3	3	1-3
Neponset	6-30	20-27	1.25-1.35	0.6-2.0	0.11-0.18	7.9-9.0	<2	Low	0.43			
	30	---	---	---	---	---	---	---	---			
NBA	0-4	16-22	---	0.6-2.0	0.16-0.17	>8.4	4-16	Low	0.43	3	8	1-2
Nevka	4-38	18-30	---	0.6-2.0	0.15-0.18	>8.4	<4	Moderate	0.43			
	38-60	2-5	---	>20.0	0.05-0.06	8.5-9.0	<2	Low	0.02			
NCA	0-8	16-22	---	0.6-2.0	0.16-0.17	8.5-9.0	<4	Low	0.43	3	8	1-2
Nevka	8-32	18-30	---	0.6-2.0	0.15-0.18	8.5-9.0	<2	Moderate	0.43			
	32-60	2-5	---	>20.0	0.05-0.07	8.5-9.0	<2	Low	0.02			
PAC	0-9	15-17	---	0.6-2.0	0.16-0.18	7.9-8.4	<2	Low	0.43	5	4L	.8-1
Pancheri	9-60	14-17	---	0.6-2.0	0.16-0.18	7.9-9.0	<2	Low	0.55			
PAD, PAE	0-6	15-17	---	0.6-2.0	0.16-0.18	7.9-8.4	<2	Low	0.43	5	4L	.8-1
Pancheri	6-60	14-17	---	0.6-2.0	0.16-0.18	7.9-9.0	<2	Low	0.55			
PAE2	0-4	15-17	---	0.6-2.0	0.16-0.18	7.9-8.4	<2	Low	0.43	5	4L	.8-1
Pancheri	4-60	14-17	---	0.6-2.0	0.16-0.18	7.9-9.0	<2	Low	0.55			
PBF*:												
Pancheri	0-7	15-17	---	0.6-2.0	0.16-0.18	7.9-8.4	<2	Low	0.43	5	4L	.8-1
	7-60	14-17	---	0.6-2.0	0.16-0.18	7.9-9.0	<2	Low	0.55			
Highams Variant	0-6	19-22	1.30-1.40	0.6-2.0	0.12-0.13	7.9-9.0	<2	Low	0.32	1	8	---
	6-13	19-22	1.30-1.40	0.6-2.0	0.12-0.13	8.5-9.0	<2	Low	0.37			
	13	---	---	---	---	---	---	---	---			
Rock outcrop.												
PD*:												
Pits.												
Dumps.												
RAD	0-3	15-20	---	2.0-6.0	0.12-0.14	8.5-9.0	<2	Low	0.10	2	4	.5-1
Ramshorn	3-60	10-15	---	2.0-6.0	0.05-0.11	>8.4	<2	Low	0.05			
RBD*:												
Ramshorn Variant	0-10	10-15	1.25-1.35	0.6-2.0	0.11-0.14	7.9-8.4	<2	Low	0.24	1	8	1-3
	10-35	10-15	1.25-1.35	2.0-6.0	0.07-0.08	8.5-9.0	<2	Low	0.32			
	35	---	---	---	---	---	---	---	---			

See footnote at end of table.

TABLE 14.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
									K	T		
	In	Pct	G/cm³	In/hr	In/in	pH	Mmhos/cm					Pct
RBD*:												
Highams	0-5	10-15	1.40-1.50	0.6-2.0	0.14-0.16	7.4-8.4	<2	Low	0.28	2	4L	2-3
	5-17	10-17	1.50-1.60	2.0-6.0	0.08-0.11	7.9-9.0	<2	Low	0.32			
	17	---	---	---	---	---	---	---	---			
RBE*:												
Ramshorn Variant	0-3	10-15	1.25-1.35	0.6-2.0	0.11-0.14	7.9-8.4	<2	Low	0.24	1	8	1-3
	3-30	10-15	1.25-1.35	2.0-6.0	0.07-0.08	8.5-9.0	<2	Low	0.32			
	30	---	---	---	---	---	---	---	---			
Highams	0-6	10-15	1.40-1.50	0.6-2.0	0.14-0.16	7.4-8.4	<2	Low	0.28	2	4L	2-3
	6-14	10-17	1.50-1.60	0.6-2.0	0.08-0.11	7.9-9.0	<2	Low	0.32			
	14	---	---	---	---	---	---	---	---			
RCG*:												
Rexmont	0-8	18-22	1.45-1.55	0.6-2.0	0.09-0.11	7.9-8.4	<2	Low	0.28	1	6	2-4
	8-15	18-22	1.50-1.60	0.6-2.0	0.08-0.09	7.9-9.0	<2	Low	0.28			
	15	---	---	---	---	---	---	---	---			
Rock outcrop.												
RD	0-3	20-27	1.40-1.50	0.6-2.0	0.14-0.16	8.5-9.0	4-8	Low	0.32	1	8	2-4
Rich	3-18	45-60	1.35-1.45	0.06-0.2	0.12-0.16	8.5-9.0	4-8	High	0.20			
	18-60	16-20	1.35-1.45	0.6-2.0	0.14-0.18	7.9-9.0	2-4	Low	0.49			
RE	0-2	22-27	1.40-1.50	0.6-2.0	0.13-0.17	7.9-9.0	2-4	Low	0.37	1	4L	2-5
Rich	2-19	45-60	1.35-1.45	0.06-0.2	0.11-0.15	>7.8	4-16	High	0.24			
	19-60	17-25	1.45-1.55	0.6-6.0	0.11-0.15	>9.0	2-8	Low	0.28			
RFD	0-24	20-27	---	0.6-2.0	0.13-0.17	6.1-7.3	<2	Low	0.20	4	6	2-4
Richens	24-60	40-50	---	0.06-0.2	0.14-0.18	6.1-7.3	<2	High	0.32			
RGF*:												
Richens	0-24	20-27	---	0.6-2.0	0.13-0.17	6.1-7.3	<2	Low	0.20	4	6	2-4
	24-60	40-50	---	0.06-0.2	0.14-0.18	6.1-7.3	<2	High	0.32			
Agassiz	0-10	18-27	1.10-1.15	0.6-2.0	0.07-0.10	6.1-8.4	<2	Low	0.15	1	8	1-3
	10-16	20-30	1.15-1.25	0.6-2.0	0.07-0.10	6.1-8.4	<2	Low	0.15			
	16	---	---	---	---	---	---	---	---			
RHC	0-5	18-24	1.25-1.35	0.6-2.0	0.12-0.15	7.9-9.0	<2	Moderate	0.37	3	5	1-3
Richville	5-34	18-33	1.30-1.40	0.2-0.6	0.13-0.17	7.9-9.0	<2	Moderate	0.43			
	34	---	---	---	---	---	---	---	---			
RHD	0-5	18-24	1.25-1.35	0.6-2.0	0.12-0.15	7.9-9.0	<2	Moderate	0.37	3	5	1-3
Richville	5-34	18-33	1.30-1.40	0.2-0.6	0.13-0.17	7.9-9.0	<2	Moderate	0.43			
	34	---	---	---	---	---	---	---	---			
SA	0-6	15-25	1.20-1.30	0.6-2.0	0.15-0.17	>7.8	<2	Low	0.37	5	8	1-3
Saleratus	6-45	20-34	1.20-1.30	0.06-0.2	0.16-0.18	>7.8	<2	Low	0.49			
	45-60	20-34	1.20-1.30	0.06-0.6	0.16-0.18	>7.8	<2	Low	0.49			
SB	0-4	15-25	1.35-1.45	0.6-2.0	0.11-0.14	>8.4	4-8	Low	0.37	5	4L	1-3
Saleratus	4-45	22-34	1.35-1.45	0.06-0.2	0.13-0.16	>8.4	2-4	Low	0.49			
	45-60	20-34	1.35-1.45	0.06-0.6	0.13-0.16	>8.4	2-4	Low	0.49			
SC*:												
Saleratus Variant	0-3	5-8	1.50-1.60	6.0-2.0	0.08-0.10	7.4-8.4	<2	Low	0.20	3	2	---
	3-30	2-5	1.50-1.60	6.0-2.0	0.06-0.08	7.4-9.0	<2	Low	0.37			
	30-60	2-5	1.50-1.60	6.0-2.0	0.03-0.07	7.4-9.0	<2	Low	0.17			
Canburn Variant-	0-18	3-10	1.50-1.60	6.0-20	0.07-0.09	6.6-8.4	<2	Low	0.15	5	8	3-5
	18-60	3-10	1.50-1.60	6.0-20	0.06-0.10	7.9-9.0	<2	Low	0.20			
SDF	0-2	5-10	---	2.0-6.0	0.09-0.11	6.1-6.5	<2	Low	0.28	5	3	5-1
Sambrito	2-60	6-10	---	2.0-6.0	0.06-0.11	6.1-7.3	<2	Low	0.15			

See footnote at end of table.

TABLE 14.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
									K	T		
	In	Pct	G/cm³	In/hr	In/in	pH	Mmhos/cm					Pct
SEE----------	0-21	7-15	1.30-1.45	0.6-2.0	0.08-0.12	5.6-6.5	<2	Low--------	0.32	2	8	2-5
Scout	21-31	3-10	1.30-1.45	2.0-6.0	0.06-0.08	5.6-6.5	<2	Low--------	0.24			
	31-60	3-10	1.30-1.45	2.0-6.0	0.04-0.06	5.6-6.5	<2	Low--------	0.32			
SFD----------	0-8	18-22	---	0.6-2.0	0.09-0.12	7.9-8.4	<2	Low--------	0.24	3	8	2-3
Searla	8-24	28-32	---	0.2-0.6	0.06-0.08	7.9-8.4	<2	Low--------	0.20			
	24-41	20-25	---	0.6-2.0	0.07-0.10	7.9-9.0	<2	Low--------	0.24			
	41	---	---	---	---	---	---	----------	----			
SGF----------	0-5	10-15	1.45-1.55	0.6-2.0	0.12-0.14	7.9-9.0	<2	Low--------	0.32	3	8	1-3
Slinger	5-14	12-18	1.45-1.55	0.6-2.0	0.11-0.13	7.9-9.0	<2	Low--------	0.37			
	14-23	12-18	1.50-1.65	2.0-6.0	0.08-0.11	7.9-9.0	<2	Low--------	0.28			
	23	---	---	---	---	---	---	----------	----			
SHF----------	0-5	12-22	1.50-1.60	0.6-2.0	0.10-0.12	6.6-8.4	<2	Low--------	0.28	1	8	1-2
Solak	5-15	12-20	1.45-1.55	0.6-2.0	0.07-0.09	7.4-9.0	<2	Low--------	0.28			
	15	---	---	---	---	---	---	----------	----			
SJF----------	0-5	12-22	1.50-1.60	0.6-2.0	0.10-0.12	6.6-8.4	<2	Low--------	0.28	1	8	1-2
Solak	5-12	12-20	1.45-1.55	0.6-2.0	0.07-0.09	7.4-9.0	<2	Low--------	0.28			
	12	---	---	---	---	---	---	----------	----			
SKF*:												
Solak----------	0-4	12-22	1.50-1.60	0.6-2.0	0.08-0.10	6.6-8.4	<2	Low--------	0.24	1	8	1-2
	4-15	12-20	1.45-1.55	0.6-2.0	0.07-0.09	7.4-9.0	<2	Low--------	0.28			
	15	---	---	---	---	---	---	----------	----			
Ranruff---------	0-5	15-22	1.50-1.60	0.6-2.0	0.12-0.14	7.9-9.0	<2	Low--------	0.28	1	5	1-2
	5-16	15-22	1.50-1.60	0.6-2.0	0.11-0.13	7.9-9.0	<2	Low--------	0.37			
	16	---	---	---	---	---	---	----------	----			
Rock outcrop.												
SLE----------	0-10	12-17	1.40-1.50	0.6-2.0	0.12-0.18	6.1-7.3	<2	Low--------	0.28	1	5	1-3
St. Marys	10-45	10-16	1.50-1.65	0.6-6.0	0.05-0.08	6.1-7.8	<2	Low--------	0.17			
	45	---	---	---	---	---	---	----------	----			
SME*:												
St. Marys-------	0-10	12-17	1.40-1.50	0.6-2.0	0.12-0.18	6.1-7.3	<2	Low--------	0.28	1	5	1-3
	10-45	10-16	1.50-1.65	0.6-6.0	0.05-0.08	6.1-7.8	<2	Low--------	0.17			
	45	---	---	---	---	---	---	----------	----			
Yeljack---------	0-14	18-22	1.40-1.50	0.6-2.0	0.15-0.17	5.6-7.3	<2	Low--------	0.20	5	5	2-5
	14-32	18-22	1.40-1.50	0.6-2.0	0.13-0.17	6.1-7.3	<2	Low--------	0.37			
	32-60	28-33	1.40-1.50	0.2-0.6	0.14-0.18	5.6-7.3	<2	Moderate	0.43			
SNF----------	0-8	15-20	---	0.6-2.0	0.09-0.11	6.6-7.3	<2	Low--------	0.17	1	8	2-4
Sumine	8-22	20-25	---	0.6-2.0	0.08-0.12	6.6-8.4	<2	Low--------	0.20			
	22-28	10-18	---	2.0-6.0	0.04-0.07	6.6-8.4	<2	Low--------	0.20			
	28	---	---	---	---	---	---	----------	----			
TAB----------	0-13	16-25	1.35-1.45	0.6-2.0	0.17-0.18	6.6-8.4	<2	Low--------	0.28	5	6	2-3
Thatcher	13-31	28-35	1.35-1.45	0.2-0.6	0.15-0.18	6.6-8.4	<2	Low--------	0.49			
	31-60	12-25	1.35-1.50	0.6-2.0	0.11-0.17	7.4-9.0	<2	Low--------	0.49			
TAD----------	0-11	16-25	1.35-1.45	0.6-2.0	0.17-0.18	6.6-8.4	<2	Low--------	0.28	5	6	2-3
Thatcher	11-38	28-35	1.35-1.45	0.2-0.6	0.15-0.18	6.6-8.4	<2	Low--------	0.49			
	38-60	12-25	1.35-1.50	0.6-2.0	0.11-0.17	7.4-9.0	<2	Low--------	0.49			
TAE----------	0-10	16-25	1.35-1.45	0.6-2.0	0.17-0.18	6.6-8.4	<2	Low--------	0.28	5	6	2-3
Thatcher	10-35	24-35	1.35-1.45	0.2-0.6	0.15-0.18	6.6-8.4	<2	Low--------	0.49			
	35-60	12-25	1.35-1.50	0.6-2.0	0.11-0.17	7.4-9.0	<2	Low--------	0.49			
TBA----------	0-11	16-25	1.35-1.45	0.6-2.0	0.17-0.18	6.6-8.4	<2	Low--------	0.28	5	6	2-3
Thatcher	11-34	28-35	1.35-1.45	0.2-0.6	0.15-0.18	6.6-8.4	<2	Low--------	0.49			
	34-60	12-25	1.40-1.55	0.6-2.0	0.09-0.13	7.4-9.0	<2	Low--------	0.37			

See footnote at end of table.

TABLE 14.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
									K	T		
	In	Pct	G/cm3	In/hr	In/in	pH	Mmhos/cm					Pct
TBB	0-13	16-25	1.35-1.45	0.6-2.0	0.17-0.18	6.6-8.4	<2	Low	0.28	5	6	2-3
Thatcher	13-44	28-35	1.35-1.45	0.2-0.6	0.15-0.18	6.6-8.4	<2	Low	0.49			
	44-60	12-25	1.40-1.55	0.6-2.0	0.09-0.13	7.4-9.0	<2	Low	0.37			
TBC	0-12	16-25	1.35-1.45	0.6-2.0	0.17-0.18	6.6-8.4	<2	Low	0.28	5	6	2-3
Thatcher	12-29	28-35	1.35-1.45	0.2-0.6	0.15-0.18	6.6-8.4	<2	Low	0.49			
	29-60	25-32	1.35-1.45	0.2-0.6	0.15-0.18	7.9-9.0	<2	Low	0.49			
TBD	0-10	16-25	1.35-1.45	0.6-2.0	0.17-0.18	6.6-8.4	<2	Low	0.28	5	6	2-3
Thatcher	10-22	28-35	1.35-1.45	0.2-0.6	0.15-0.18	6.6-8.4	<2	Low	0.49			
	22-60	25-32	1.35-1.45	0.2-0.6	0.15-0.18	7.9-9.0	<2	Low	0.49			
VAE	0-7	15-22	1.20-1.30	0.6-2.0	0.14-0.17	7.4-8.4	<2	Low	0.28	2	4L	2-4
Vanni	7-60	18-27	1.20-1.30	0.6-2.0	0.16-0.18	>7.8	<2	Low	0.43			
VAF	0-7	15-22	1.20-1.30	0.6-2.0	0.14-0.17	7.4-8.4	<2	Low	0.28	2	4L	2-4
Vanni	7-60	18-27	1.20-1.30	0.6-2.0	0.16-0.18	>7.8	<2	Low	0.43			
VBF	0-7	18-22	1.50-1.60	0.6-2.0	0.09-0.11	7.9-8.4	<2	Low	0.20	5	8	2-4
Vanni	7-60	18-25	1.50-1.60	0.6-2.0	0.12-0.15	7.9-9.0	<2	Low	0.37			
VCD	0-5	20-24	1.35-1.45	0.2-0.6	0.16-0.17	7.9-8.4	<2	Low	0.43	5	4L	1-3
Vicking	5-24	27-35	1.35-1.50	0.06-0.2	0.13-0.16	7.9-8.4	<2	Moderate	0.43			
	24-60	22-26	1.45-1.55	0.2-0.6	0.09-0.13	7.9-9.0	<2	Low	0.32			
WA	0-7	15-25	1.30-1.40	0.6-2.0	0.16-0.17	7.9-9.0	<2	Low	0.28	3	8	2-4
Wader	7-19	13-18	1.25-1.35	0.6-2.0	0.16-0.18	7.9-8.4	<2	Low	0.49			
	19-36	10-15	1.40-1.50	2.0-6.0	0.11-0.12	7.9-8.4	<2	Low	0.43			
	36-60	3-5	1.55-1.65	>20	0.05-0.06	7.9-8.4	<2	Low	0.02			
WB	0-11	15-25	1.30-1.40	0.6-2.0	0.11-0.14	>8.4	4-16	Low	0.28	3	8	2-4
Wader	11-46	13-18	1.25-1.35	0.6-2.0	0.13-0.16	7.9-9.0	4-8	Low	0.49			
	46-60	3-5	1.55-1.65	>20	0.05-0.06	7.9-8.4	2-4	Low	0.02			
WC	0-8	10-16	1.25-1.35	0.6-2.0	0.11-0.14	7.9-9.0	<2	Low	0.24	1	8	2-4
Wader Variant	8-60	5-10	1.45-1.55	6.0-20	0.03-0.05	7.9-9.0	<2	Low	0.10			
WDC	0-11	15-25	1.25-1.35	0.6-2.0	0.16-0.18	7.4-8.4	<2	Low	0.28	2	5	1-2
Woodpass	11-38	18-32	1.25-1.35	0.2-0.6	0.14-0.18	7.9-9.0	<2	Low	0.37			
	38-60	18-32	1.25-1.35	0.2-0.6	0.14-0.18	7.9-9.0	<2	Low	0.43			
YAE	0-10	18-25	1.20-1.35	0.6-2.0	0.16-0.18	5.6-7.3	<2	Low	0.24	1	6	2-5
Yeates Hollow	10-52	35-45	1.15-1.30	0.06-0.2	0.07-0.10	5.1-7.3	<2	Moderate	0.17			
	52	---	---	---	---	---	---	---	---			
YBD*:												
Yeates Hollow	0-12	20-25	1.25-1.35	0.6-2.0	0.09-0.11	6.1-7.3	<2	Low	0.24	1	8	2-5
	12-59	35-45	1.20-1.30	0.06-0.2	0.07-0.10	6.1-7.3	<2	Moderate	0.20			
	59-72	10-20	1.20-1.30	2.0-6.0	0.04-0.06	6.1-7.3	<2	Low	0.24			
Obray	0-8	28-35	1.25-1.35	<0.06	0.17-0.18	6.1-7.3	<2	Moderate	0.24	4	4	1-2
	8-57	45-50	1.20-1.30	<0.06	0.17-0.19	6.1-7.8	<2	High	0.24			
	57-60	45-55	1.20-1.30	0.06-0.2	0.14-0.16	6.1-7.3	<2	High	0.24			
YCD	0-30	18-22	1.40-1.50	0.6-2.0	0.15-0.17	5.6-7.3	<2	Low	0.20	5	5	2-5
Yeljack	30-60	28-33	1.40-1.50	0.2-0.6	0.14-0.18	5.6-7.3	<2	Moderate	0.43			
YDE	0-26	18-22	1.40-1.50	0.6-2.0	0.15-0.17	5.6-7.3	<2	Low	0.20	5	5	2-5
Yeljack	26-37	18-22	1.40-1.50	0.6-2.0	0.13-0.17	6.1-7.3	<2	Low	0.37			
	37-60	28-33	1.40-1.50	0.2-0.6	0.13-0.15	5.6-7.3	<2	Moderate	0.37			
YEE*:												
Yeljack	0-14	18-22	1.40-1.50	0.6-2.0	0.15-0.17	5.6-7.3	<2	Low	0.20	5	5	2-5
	14-32	18-22	1.40-1.50	0.6-2.0	0.13-0.17	6.1-7.3	<2	Low	0.37			
	32-60	28-33	1.40-1.50	0.2-0.6	0.14-0.18	5.6-7.3	<2	Moderate	0.43			

See footnote at end of table.

TABLE 14.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
									K	T		
	In	Pct	G/cm3	In/hr	In/in	pH	Mmhos/cm					Pct
YEE*:												
Cluff	0-4	18-24	---	0.6-2.0	0.10-0.12	5.6-6.5	<2	Low	0.28	2	8	2-5
	4-14	18-24	---	0.6-2.0	0.07-0.09	5.1-6.0	<2	Low	0.32			
	14-40	35-50	---	0.2-0.6	0.06-0.08	4.5-6.0	<2	Moderate	0.28			
	40	---	---	---	---	---	---	---	---			
ZAD*:												
Zagg	0-3	28-35	1.40-1.50	0.2-0.6	0.11-0.15	7.9-9.0	<2	Moderate	0.32	5	4L	1-3
	3-60	35-45	1.40-1.50	0.06-0.2	0.17-0.18	7.9-9.0	<2	High	0.32			
Zagg	0-9	28-35	1.35-1.45	0.2-0.6	0.14-0.18	7.9-9.0	<2	Moderate	0.37	5	4L	1-3
	9-60	35-45	1.40-1.50	0.06-0.2	0.17-0.18	7.9-9.0	<2	High	0.32			
ZBC	0-8	28-35	1.30-1.40	0.06-0.2	0.16-0.18	7.9-9.0	<2	Moderate	0.43	5	4L	1-2
Zegro	8-37	35-45	1.30-1.40	0.06-0.2	0.16-0.18	7.9-9.0	<2	High	0.37			
	37	---	---	---	---	---	---	---	---			
ZCD*:												
Zegro	0-8	28-35	1.30-1.40	0.06-0.2	0.16-0.18	7.9-9.0	<2	Moderate	0.43	5	4L	1-2
	8-37	35-45	1.30-1.40	0.06-0.2	0.16-0.18	7.9-9.0	<2	High	0.37			
	37	---	---	---	---	---	---	---	---			
Zagg	0-3	28-35	1.35-1.45	0.2-0.6	0.14-0.18	7.9-9.0	<2	Moderate	0.37	5	4L	1-3
	3-60	35-45	1.40-1.50	0.06-0.2	0.17-0.18	7.9-9.0	<2	High	0.32			

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 15.--WATER FEATURES

["Flooding" and "water table" and terms such as "rare" and "apparent" are explained in the text. The symbol > means more than. Absence of an entry indicates that the feature is not a concern]

Soil name and map symbol	Hydrologic group	Flooding			High water table		
		Frequency	Duration	Months	Depth	Kind	Months
					Ft		
AAD*, AAF*: Agassiz	D	None	---	---	>6.0	---	---
Mult	C	None	---	---	>6.0	---	---
ABF*: Agassiz	D	None	---	---	>6.0	---	---
Richville	C	None	---	---	>6.0	---	---
ACF*: Agassiz	D	None	---	---	>6.0	---	---
Rock outcrop.							
ADD, ADE, AEC Alhark	B	None	---	---	>6.0	---	---
AFD Ant Flat	C	None	---	---	>6.0	---	---
BAD Baird Hollow	C	None	---	---	>6.0	---	---
BB, BC, BD Bear Lake	D	Occasional	Brief	May-Jul	1.0-2.0	Apparent	May-Jul
BEF Bequinn	B	None	---	---	>6.0	---	---
BFB Bereniceton	B	Rare	---	---	>6.0	---	---
BGE Bereniceton	B	None	---	---	>6.0	---	---
BHA Bockston	B	Rare	---	---	>6.0	---	---
BHB Bockston	B	None	---	---	>6.0	---	---
BJC, BJE Bullnel	C	None	---	---	>6.0	---	---
CA Canburn	D	Frequent	Long to very long.	Feb-May	0-1.5	Apparent	Feb-Jul
CBD*: Cloud Rim	B	None	---	---	>6.0	---	---
McCarey	C	None	---	---	>6.0	---	---
CCE Cluff	C	None	---	---	>6.0	---	---
CDD, CDE Condie	B	None	---	---	>6.0	---	---

See footnote at end of table.

TABLE 15.--WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table		
		Frequency	Duration	Months	Depth	Kind	Months
					Ft		
CEA---------- Cowco	B	Rare----------	---	---	>6.0	---	---
CEB, CFA---------- Cowco	B	None----------	---	---	>6.0	---	---
CGD, CGF---------- Cutoff	C	None----------	---	---	>6.0	---	---
CHF*:							
Cutoff----------	C	None----------	---	---	>6.0	---	---
Falula----------	D	None----------	---	---	>6.0	---	---
DAF, DBF, DCF---------- Dagan	B	None----------	---	---	>6.0	---	---
DDF*:							
Dagan----------	B	None----------	---	---	>6.0	---	---
Rubble land.							
DEE, DFC---------- Dennot	B	None----------	---	---	>6.0	---	---
DGF---------- Despain	B	None----------	---	---	>6.0	---	---
DHB---------- Despain Variant	B	None----------	---	---	>6.0	---	---
DJA---------- Duckree	B	Rare----------	---	---	>6.0	---	---
DKD, DLE---------- Duckree	B	None----------	---	---	>6.0	---	---
DMF*:							
Duckree----------	B	None----------	---	---	>6.0	---	---
St. Marys----------	B	None----------	---	---	>6.0	---	---
EAC, EAE---------- Ellett	D	None----------	---	---	>6.0	---	---
EBD, EBE---------- Ercan	B	None----------	---	---	>6.0	---	---
ECE---------- Etchen	C	None----------	---	---	>6.0	---	---
FAE, FBC---------- Falula	D	None----------	---	---	>6.0	---	---
FCE*:							
Falula----------	D	None----------	---	---	>6.0	---	---
Kearl----------	C	None----------	---	---	>6.0	---	---
FDF---------- Flygare	B	None----------	---	---	>6.0	---	---
FEE*:							
Fontreen----------	B	None----------	---	---	>6.0	---	---
Rexmont----------	D	None----------	---	---	>6.0	---	---

See footnote at end of table.

TABLE 15.--WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table		
		Frequency	Duration	Months	Depth	Kind	Months
					Ft		
FFF, FGE---------- Foxol	D	None----------	---	---	>6.0	---	---
GAD---------- Gobine	B	None----------	---	---	>6.0	---	---
GBE*: Gridge----------	D	None----------	---	---	>6.0	---	---
Rock outcrop.							
GCE---------- Guilder	C	None----------	---	---	>6.0	---	---
HAB---------- Hades	B	None----------	---	---	>6.0	---	---
HBD---------- Hawkins	C	None----------	---	---	>6.0	---	---
HC---------- Hival	D	Rare----------	---	---	1.5-2.5	Apparent	May-Jul
HDC---------- Horrocks	B	None----------	---	---	>6.0	---	---
HEF---------- Hourglass	B	None----------	---	---	>6.0	---	---
JAE, JAF---------- Jebo	B	None----------	---	---	>6.0	---	---
KAF---------- Kamack	B	None----------	---	---	>6.0	---	---
KBD, KBE, KBF---------- Kearl	C	None----------	---	---	>6.0	---	---
KCD*: Kearl----------	C	None----------	---	---	>6.0	---	---
Richville----------	C	None----------	---	---	>6.0	---	---
LAD---------- Lakridge	C	None----------	---	---	>6.0	---	---
LBC---------- Lariat	B	None----------	---	---	>6.0	---	---
LCD, LCE---------- Lonjon	B	None----------	---	---	>6.0	---	---
LDD, LDF---------- Lucky Star	B	None----------	---	---	>6.0	---	---
LEF*: Lucky Star----------	B	None----------	---	---	>6.0	---	---
Condie----------	B	None----------	---	---	>6.0	---	---
LFF*: Lundy----------	D	None----------	---	---	>6.0	---	---
Rock outcrop.							

See footnote at end of table.

TABLE 15.--WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table		
		Frequency	Duration	Months	Depth	Kind	Months
					Ft		
MAA---------- Matheson	B	Rare----------	---	---	3.0-5.0	Apparent	May-Jul
MBE*: Mirror Lake----------	A	None----------	---	---	>6.0	---	---
Sambrito----------	B	None----------	---	---	>6.0	---	---
MCD*: Mult----------	C	None----------	---	---	>6.0	---	---
Agassiz----------	D	None----------	---	---	>6.0	---	---
MDC*, MDE*: Murphy----------	C	None----------	---	---	>6.0	---	---
Richville----------	C	None----------	---	---	>6.0	---	---
NAD---------- Neponset	C	None----------	---	---	>6.0	---	---
NBA---------- Nevka	C	Rare----------	---	---	2.0-3.0	Apparent	May-Jul
NCA---------- Nevka	C	Rare----------	---	---	1.5-3.0	Apparent	May-Jul
PAC, PAD, PAE, PAE2----- Pancheri	B	None----------	---	---	>6.0	---	---
PBF*: Pancheri----------	B	None----------	---	---	>6.0	---	---
Highams Variant--------	D	None----------	---	---	>6.0	---	---
Rock outcrop.							
PD*: Pits.							
Dumps.							
RAD---------- Ramshorn	B	None----------	---	---	>6.0	---	---
RBD*, RBE*: Ramshorn Variant-------	C	None----------	---	---	>6.0	---	---
Highams----------	D	None----------	---	---	>6.0	---	---
RCG*: Rexmont----------	D	None----------	---	---	>6.0	---	---
Rock outcrop.							
RD---------- Rich	D	Rare----------	---	---	2.0-3.5	Apparent	May-Jul
RE---------- Rich	C	Rare----------	---	---	3.5-6.0	Apparent	May-Jul
RFD---------- Richens	C	None----------	---	---	>6.0	---	---
RGF*: Richens----------	C	None----------	---	---	>6.0	---	---

See footnote at end of table.

TABLE 15.--WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table		
		Frequency	Duration	Months	Depth	Kind	Months
					Ft		
RGF*: Agassiz	D	None	---	---	>6.0	---	---
RHC, RHD- Richville	C	None	---	---	>6.0	---	---
SA- Saleratus	C	Rare	---	---	1.5-2.5	Apparent	May-Jul
SB- Saleratus	C	Rare	---	---	2.0-2.5	Apparent	May-Jul
SC*: Saleratus Variant	C	None	---	---	1.0-3.0	Apparent	May-Jul
Canburn Variant	D	Occasional	Long	May-Jun	0-2.0	Apparent	May-Jul
SDF- Sambrito	B	None	---	---	>6.0	---	---
SEE- Scout	B	None	---	---	>6.0	---	---
SFD- Searla	B	None	---	---	>6.0	---	---
SGF- Slinger	B	None	---	---	>6.0	---	---
SHF, SJF- Solak	D	None	---	---	>6.0	---	---
SKF*: Solak	D	None	---	---	>6.0	---	---
Ranruff	D	None	---	---	>6.0	---	---
Rock outcrop.							
SLE- St. Marys	B	None	---	---	>6.0	---	---
SME*: St. Marys	B	None	---	---	>6.0	---	---
Yeljack	B	None	---	---	>6.0	---	---
SNF- Sumine	C	None	---	---	>6.0	---	---
TAB, TAD, TAE, TBA, TBB, TBC, TBD- Thatcher	B	None	---	---	>6.0	---	---
VAE, VAF, VBF- Vanni	B	None	---	---	>6.0	---	---
VCD- Vicking	D	None	---	---	>6.0	---	---
WA- Wader	C	Common	Brief	May-Jun	1.5-2.5	Apparent	May-Jul
WB- Wader	C	Common	Brief	May-Jun	2.0-3.0	Apparent	May-Jul

See footnote at end of table.

TABLE 15.--WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table		
		Frequency	Duration	Months	Depth	Kind	Months
					Ft		
WC---------- Wader Variant	D	Rare----------	---	---	1.0-2.5	Apparent	May-Jul
WDC---------- Woodpass	B	None----------	---	---	>6.0	---	---
YAE---------- Yeates Hollow	C	None----------	---	---	>6.0	---	---
YBD*:							
Yeates Hollow----------	C	None----------	---	---	>6.0	---	---
Obray----------	D	None----------	---	---	>6.0	---	---
YCD, YDE---------- Yeljack	B	None----------	---	---	>6.0	---	---
YEE*:							
Yeljack----------	B	None----------	---	---	>6.0	---	---
Cluff----------	C	None----------	---	---	>6.0	---	---
ZAD*:							
Zagg----------	C	None----------	---	---	>6.0	---	---
Zagg----------	C	None----------	---	---	>6.0	---	---
ZBC---------- Zegro	C	None----------	---	---	>6.0	---	---
ZCD*:							
Zegro----------	C	None----------	---	---	>6.0	---	---
Zagg----------	C	None----------	---	---	>6.0	---	---

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 16.--SOIL FEATURES

[The symbol > means more than. Absence of an entry indicates that the feature is not a concern]

Soil name and map symbol	Bedrock		Cemented pan		Potential frost action	Risk of corrosion	
	Depth	Hardness	Depth	Hardness		Uncoated steel	Concrete
	In		In				
AAD*, AAF*:							
Agassiz	10-20	Hard	---	---	Moderate	High	Moderate.
Mult	20-40	Hard	---	---	Moderate	High	Moderate.
ABF*:							
Agassiz	10-20	Hard	---	---	Moderate	High	Moderate.
Richville	20-40	Soft	---	---	Moderate	High	Moderate.
ACF*:							
Agassiz	10-20	Hard	---	---	Moderate	High	Moderate.
Rock outcrop.							
ADD, ADE Alhark	40-60	Soft	---	---	Moderate	High	Moderate.
AEC Alhark	>60	---	---	---	Moderate	High	Moderate.
AFD Ant Flat	>60	---	---	---	Moderate	High	Moderate.
BAD Baird Hollow	>60	---	---	---	Moderate	High	Moderate.
BB, BC, BD Bear Lake	>60	---	---	---	High	High	Moderate.
BEF Bequinn	>60	---	---	---	Low	High	Moderate.
BFB, BGE Bereniceton	>60	---	---	---	Low	High	Moderate.
BHA, BHB Bockston	>60	---	---	---	Moderate	High	Low.
BJC, BJE Bullnel	20-40	Soft	---	---	Moderate	High	Low.
CA Canburn	>60	---	---	---	High	High	Moderate.
CBD*:							
Cloud Rim	>60	---	---	---	Moderate	Moderate	Moderate.
McCarey	25-40	Hard	---	---	Moderate	High	Low.
CCE Cluff	40-60	Hard	---	---	Moderate	High	Moderate.
CDD, CDE Condie	>60	---	---	---	Moderate	Moderate	Moderate.
CEA, CEB, CFA Cowco	>60	---	---	---	Moderate	High	Moderate.
CGD, CGF Cutoff	20-40	Hard	---	---	Moderate	High	Moderate.

See footnote at end of table.

TABLE 16.--SOIL FEATURES--Continued

Soil name and map symbol	Bedrock		Cemented pan		Potential frost action	Risk of corrosion	
	Depth	Hardness	Depth	Hardness		Uncoated steel	Concrete
	In		In				
CHF*:							
Cutoff	20-40	Hard	---	---	Moderate	High	Moderate.
Falula	10-20	Hard	---	---	Moderate	High	Moderate.
DAF, DBF Dagan	40-60	Soft	---	---	Moderate	High	Moderate.
DCF Dagan	>60	---	---	---	Moderate	High	Moderate.
DDF*:							
Dagan	40-60	Soft	---	---	Moderate	High	Moderate.
Rubble Land.							
DEE Dennot	40-60	Hard	---	---	Moderate	High	Moderate.
DFC Dennot	>60	---	---	---	Moderate	High	Moderate.
DGF Despain	>60	---	---	---	Moderate	High	Moderate.
DHB Despain Variant	>60	---	---	---	Moderate	High	Moderate.
DJA, DKD, DLE Duckree	>60	---	---	---	Low	High	Moderate.
DMF*:							
Duckree	>60	---	---	---	Low	High	Moderate.
St. Marys	40-60	Hard	---	---	Moderate	High	Moderate.
EAC, EAE Ellett	7-20	Soft	---	---	Moderate	High	Moderate.
EBD, EBE Ercan	40-60	Soft	---	---	Moderate	Moderate	Moderate.
ECE Etchen	20-40	Hard	---	---	Moderate	High	Low.
FAE, FBC Falula	10-20	Hard	---	---	Moderate	High	Moderate.
FCE*:							
Falula	10-20	Hard	---	---	Moderate	High	Moderate.
Kearl	20-40	Hard	---	---	Moderate	High	Moderate.
FDF Flygare	>60	---	---	---	Moderate	Moderate	Moderate.
FEE*:							
Fontreen	>60	---	---	---	Moderate	High	Moderate.
Rexmont	8-10	Hard	---	---	Moderate	High	Moderate.
FFF, FGE Foxol	10-20	Hard	---	---	Moderate	Moderate	Moderate.
GAD Gobine	>60	---	---	---	Moderate	High	Moderate.

See footnote at end of table.

TABLE 16.--SOIL FEATURES--Continued

Soil name and map symbol	Bedrock		Cemented pan		Potential frost action	Risk of corrosion	
	Depth	Hardness	Depth	Hardness		Uncoated steel	Concrete
	In		In				
GBE*:							
Gridge	10-20	Hard	---	---	Moderate	High	Moderate.
Rock outcrop.							
GCE---- Guilder	50-60	Soft	---	---	Moderate	High	Low.
HAB---- Hades	>60	Soft	---	---	Moderate	High	Moderate.
HBD---- Hawkins	>60	---	---	---	Moderate	High	Moderate.
HC---- Hival	>60	---	---	---	High	High	Moderate.
HDC---- Horrocks	40-60	Hard	---	---	Moderate	High	Moderate.
HEF---- Hourglass	40-60	Hard	---	---	Moderate	High	Moderate.
JAE, JAF---- Jebo	20-40	Hard	---	---	Moderate	High	Moderate.
KAF---- Kamack	40-60	Hard	---	---	Moderate	Moderate	Moderate.
KBD, KBE, KBF---- Kearl	20-40	Hard	---	---	Moderate	High	Moderate.
KCD*:							
Kearl	20-40	Hard	---	---	Moderate	High	Moderate.
Richville	20-40	Soft	---	---	Moderate	High	Moderate.
LAD---- Lakridge	>60	---	20-40	Thick	Moderate	High	Moderate.
LBC---- Lariat	20-40	Hard	---	---	Low	High	Moderate.
LCD, LCE---- Lonjon	20-40	Hard	---	---	Moderate	High	Moderate.
LDD, LDF---- Lucky Star	>60	---	---	---	Moderate	High	Moderate.
LEF*:							
Lucky Star	>60	---	---	---	Moderate	High	Moderate.
Condie	>60	---	---	---	Moderate	Moderate	Moderate.
LFF*:							
Lundy	10-20	Hard	---	---	Moderate	High	Moderate.
Rock outcrop.							
MAA---- Matheson	>60	---	---	---	Moderate	High	Moderate.
MBE*:							
Mirror Lake	>60	---	---	---	Low	High	Moderate.
Sambrito	>60	---	---	---	Moderate	Moderate	Moderate.

See footnote at end of table.

TABLE 16.--SOIL FEATURES--Continued

Soil name and map symbol	Bedrock		Cemented pan		Potential frost action	Risk of corrosion	
	Depth	Hardness	Depth	Hardness		Uncoated steel	Concrete
	In		In				
MCD*:							
Mult	20-40	Hard	---	---	Moderate	High	Moderate.
Agassiz	10-20	Hard	---	---	Moderate	High	Moderate.
MDC*, MDE*:							
Murphy	>60	---	---	---	Moderate	High	Moderate.
Richville	20-40	Soft	---	---	Moderate	High	Moderate.
NAD Neponset	20-40	Soft	---	---	Low	High	Moderate.
NBA, NCA Nevka	>60	---	---	---	High	High	High.
PAC, PAD, PAE, PAE2 Pancheri	>60	---	---	---	Moderate	High	Low.
PBF*:							
Pancheri	>60	---	---	---	Moderate	High	Low.
Highams Variant	10-20	Hard	---	---	Low	High	Moderate.
Rock outcrop.							
PD*:							
Pits.							
Dumps.							
RAD Ramshorn	>60	---	---	---	Moderate	High	Moderate.
RBD*, RBE*:							
Ramshorn Variant	20-40	Hard	---	---	Moderate	High	Moderate.
Highams	10-20	Hard	---	---	Low	High	Moderate.
RCG*:							
Rexmont	10-20	Hard	---	---	Moderate	High	Moderate.
Rock outcrop.							
RD Rich	>60	---	---	---	High	High	Moderate.
RE Rich	>60	---	---	---	Moderate	High	Moderate.
RFD Richens	>60	Soft	---	---	Moderate	Moderate	Low.
RGF*:							
Richens	>60	Soft	---	---	Moderate	Moderate	Low.
Agassiz	10-20	Hard	---	---	Moderate	High	Moderate.
RHC, RHD Richville	20-40	Soft	---	---	Moderate	High	Moderate.
SA Saleratus	>60	---	---	---	High	High	Moderate.
SB Saleratus	>60	---	---	---	High	High	High.

See footnote at end of table.

TABLE 16.--SOIL FEATURES--Continued

Soil name and map symbol	Bedrock		Cemented pan		Potential frost action	Risk of corrosion	
	Depth	Hardness	Depth	Hardness		Uncoated steel	Concrete
	In		In				
SC*:							
Saleratus Variant	>60	---	---	---	Moderate	High	Moderate.
Canburn Variant	>60	---	---	---	Moderate	High	Moderate.
SDF---------- Sambrito	>60	---	---	---	Moderate	Moderate	Moderate.
SEE---------- Scout	>60	---	---	---	Moderate	High	Moderate.
SFD---------- Searla	40-60	Hard	---	---	Moderate	High	Moderate.
SGF---------- Slinger	20-40	Hard	---	---	Low	High	Moderate.
SHF, SJF---------- Solak	10-20	Hard	---	---	Moderate	High	Moderate.
SKF*:							
Solak	10-20	Hard	---	---	Moderate	High	Moderate.
Ranruff	10-20	Hard	---	---	Moderate	High	Moderate.
Rock outcrop.							
SLE---------- St. Marys	40-60	Hard	---	---	Moderate	High	Moderate.
SME*:							
St. Marys	40-60	Hard	---	---	Moderate	High	Moderate.
Yeljack	>60	---	---	---	Moderate	Moderate	Moderate.
SNF---------- Sumine	20-40	Hard	---	---	Moderate	High	Moderate.
TAB, TAD, TAE, TBA, TBB, TBC, TBD---------- Thatcher	>60	---	---	---	High	High	Moderate.
VAE, VAF, VBF---------- Vanni	>60	---	---	---	Moderate	High	Moderate.
VCD---------- Vicking	>60	---	---	---	Moderate	High	Moderate.
WA, WB---------- Wader	>60	---	---	---	High	High	Moderate.
WC---------- Wader Variant	>60	---	---	---	High	High	Moderate.
WDC---------- Woodpass	>60	---	---	---	Low	High	Moderate.
YAE---------- Yeates Hollow	40-60	Hard	---	---	Moderate	High	Moderate.
YBD*:							
Yeates Hollow	>60	---	---	---	Moderate	Moderate	Low.
Obray	>60	---	---	---	Moderate	High	Moderate.

See footnote at end of table.

TABLE 16.--SOIL FEATURES--Continued

Soil name and map symbol	Bedrock		Cemented pan		Potential frost action	Risk of corrosion	
	Depth	Hardness	Depth	Hardness		Uncoated steel	Concrete
	In		In				
YCD, YDE---------- Yeljack	>60	---	---	---	Moderate-------	Moderate-------	Moderate.
YEE*: Yeljack----------	>60	---	---	---	Moderate-------	Moderate-------	Moderate.
Cluff----------	40-60	Hard	---	---	Moderate-------	High----------	Moderate.
ZAD*: Zagg----------	>60	---	---	---	Low----------	High----------	Moderate.
Zagg----------	>60	---	---	---	Low----------	High----------	Moderate.
ZBC---------- Zegro	20-40	Soft	---	---	Moderate-------	High----------	Moderate.
ZCD*: Zegro----------	20-40	Soft	---	---	Moderate-------	High----------	Moderate.
Zagg----------	>60	---	---	---	Low----------	High----------	Moderate.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 17.--CLASSIFICATION OF THE SOILS

Soil name	Family or higher taxonomic class
Agassiz	Loamy-skeletal, mixed, frigid Lithic Haploxerolls
Alhark	Fine-loamy, mixed, frigid Xerollic Calciorthids
Ant Flat	Fine, montmorillonitic, frigid Calcic Argixerolls
Baird Hollow	Clayey-skeletal, montmorillonitic Cryic Paleborolls
Bear Lake	Fine-silty, frigid Typic Calciaquolls
Bequinn	Loamy-skeletal, mixed (calcareous), frigid Xeric Torriorthents
Bereniceton	Fine-loamy, mixed (calcareous), frigid Xeric Torriorthents
Bockston	Fine-loamy, mixed, frigid Aridic Calcixerolls
Bullnel	Fine-loamy, mixed, frigid Mollic Haploxeralfs
Canburn	Fine-loamy, mixed (calcareous), frigid Cumulic Haplaquolls
Canburn Variant	Sandy, mixed Aquic Haploborolls
Cloud Rim	Fine-loamy, mixed, frigid Typic Argixerolls
Cluff	Clayey-skeletal, montmorillonitic Mollic Cryoboralfs
Condie	Loamy-skeletal, mixed Mollic Cryoboralfs
Cowco	Fine-silty, mixed (calcareous), frigid Xeric Torrifluvents
Cutoff	Loamy-skeletal, mixed, frigid Calcixerollic Xerochrepts
Dagan	Loamy-skeletal, mixed, frigid Calcic Haploxerolls
Dennot	Loamy-skeletal, mixed, frigid Typic Calcixerolls
Despain	Fine-loamy, mixed, frigid Calcic Pachic Argixerolls
Despain Variant	Loamy-skeletal, mixed, frigid Calcic Pachic Haploxerolls
Duckree	Loamy-skeletal, mixed, frigid Xerollic Calciorthids
Ellett	Loamy, mixed (calcareous), frigid, shallow Xeric Torriorthents
Ercan	Fine-loamy, mixed Cryic Paleborolls
Etchen	Loamy-skeletal, mixed, frigid Mollic Haploxeralfs
Falula	Loamy-skeletal, mixed, frigid Lithic Haploxerolls
Flygare	Loamy-skeletal, mixed Cryic Pachic Paleborolls
Fontreen	Loamy-skeletal, carbonatic, frigid Aridic Calcixerolls
Foxol	Loamy-skeletal, mixed, frigid Lithic Haploxerolls
Gobine	Fine-silty, mixed, frigid Typic Calcixerolls
Gridge	Loamy, mixed (calcareous), frigid Lithic Xerorthents
Guilder	Fine, mixed, frigid Mollic Haploxeralfs
Hades	Fine-loamy, mixed, frigid Pachic Argixerolls
Hawkins	Fine, montmorillonitic, frigid Typic Chromoxererts
Highams	Loamy-skeletal, carbonatic, frigid Lithic Xeric Torriorthents
Highams Variant	Loamy, mixed (calcareous), frigid Lithic Xeric Torriorthents
Hival	Fine, mixed, frigid Aquic Camborthids
Horrocks	Loamy-skeletal, mixed, frigid Typic Argixerolls
Hourglass	Fine-loamy, mixed Argic Cryoborolls
Jebo	Loamy-skeletal, mixed, frigid Calcic Haploxerolls
Kamack	Loamy-skeletal, mixed Typic Cryoborolls
Kearl	Coarse-loamy, mixed, frigid Calcic Haploxerolls
Lakridge	Fine-loamy, carbonatic, frigid Petrocalcic Palexerolls
Lariat	Coarse-loamy, mixed, frigid Xerollic Calciorthids
Lonjon	Loamy-skeletal, carbonatic, frigid Typic Calcixerolls
Lucky Star	Loamy-skeletal, mixed Cryic Paleborolls
Lundy	Loamy-skeletal, carbonatic, frigid Lithic Calcixerolls
Matheson	Coarse-loamy, mixed, frigid Xerollic Calciorthids
McCarey	Fine-loamy, mixed, frigid Calcic Argixerolls
Mirror Lake	Sandy-skeletal, mixed Typic Cryorthents
Mult	Fine-loamy, mixed Argic Cryoborolls
Murphy	Fine, mixed, frigid Calcixerollic Xerochrepts
Neponset	Fine-loamy, mixed (calcareous), frigid Xeric Torriorthents
Nevka	Fine-loamy, mixed, frigid Aquic Calciorthids
Obray	Fine, montmorillonitic, frigid Typic Chromoxererts
Pancheri	Coarse-silty, mixed, frigid Xerollic Calciorthids
Ramshorn	Loamy-skeletal, carbonatic, frigid Xeric Torriorthents
Ramshorn Variant	Loamy-skeletal, carbonatic, frigid Xeric Torriorthents
Ranruff	Loamy, mixed (calcareous), frigid Lithic Xeric Torriorthents
Rexmont	Loamy-skeletal, mixed, frigid Lithic Haploxerolls
Rich	Fine, montmorillonitic Udic Natriborolls
Richens	Fine, montmorillonitic Argic Pachic Cryoborolls
Richville	Fine-loamy, mixed, frigid Calcixerollic Xerochrepts
Saleratus	Fine-silty, mixed (calcareous), frigid Aquic Ustifluvents
Saleratus Variant	Mixed, frigid Aquic Ustipsamments
Sambrito	Coarse-loamy, mixed Typic Cryochrepts
Scout	Loamy-skeletal, mixed Typic Cryochrepts
Searla	Loamy-skeletal, mixed, frigid Calcic Argixerolls
Slinger	Loamy-skeletal, mixed (calcareous), frigid Xeric Torriorthents
Solak	Loamy-skeletal, mixed (calcareous), frigid Lithic Xeric Torriorthents
St. Marys	Loamy-skeletal, mixed, frigid Typic Haploxerolls
Sumine	Loamy-skeletal, mixed, frigid Aridic Argixerolls
Thatcher	Fine-silty, mixed, frigid Calcic Argixerolls.

TABLE 17.--CLASSIFICATION OF THE SOILS--Continued

Soil name	Family or higher taxonomic class
Vanni	Fine-loamy, carbonatic, frigid Typic Calcixerolls
Vicking	Fine-loamy, mixed, frigid Calcic Argixerolls
Wader	Coarse-loamy, mixed Fluvaquentic Haploborolls
Wader Variant	Sandy-skeletal, mixed Aquic Haploborolls
Woodpass	Fine-loamy, mixed, frigid Xerollic Camborthids
Yeates Hollow	Clayey-skeletal, montmorillonitic, frigid Typic Argixerolls
Yeljack	Fine-loamy, mixed Cryic Pachic Paleborolls
Zagg	Fine, montmorillonitic (calcareous), frigid Entic Chromoxererts
Zegro	Fine, mixed (calcareous), frigid Xeric Torriorthents

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