



United States  
Department of  
Agriculture

Natural  
Resources  
Conservation  
Service

In cooperation with  
United States  
Department of the  
Interior, Bureau of  
Indian Affairs; and  
Montana Agricultural  
Experiment Station

# Soil Survey of Lake County Area, Montana Part I





# How To Use This Soil Survey

---

This survey is divided into three parts. Part I includes general information about the survey area; detailed soil map units and soil series in the area; and a description of how the soils formed. Part II describes the use and management of the soils and the major soil properties. This part may be updated as further information about soil management becomes available. Part III includes the maps.

The **detailed soil maps** follow the general information about the survey area. These maps can be useful in planning the use and management of small areas.

To find information about your area of interest, locate that area on the **Index to Map Sheets**, which precedes the soil maps. Note the number of the map sheet, and turn to that sheet.

Locate your area of interest on the map sheet. Note the map unit symbols that are in that area. Turn to the **Index to Map Units** in Part I of this survey, which lists the map units by symbol and name and shows the page where each map unit is described.

The **Summary of Tables** shows which table has data on a specific land use for each detailed soil map unit. See **Contents** for sections of this publication that may address your specific needs.

A **State Soil Geographic Data Base (STATSGO)** is available for this survey area. This data base consists of a soils map at a scale of 1 to 250,000 and descriptions of groups of associated soils. It replaces the general soil map published in older soil surveys. The map and the data base can be used for multicounty planning, and map output can be tailored for a specific use. More information about the State Soil Geographic Data Base for this survey area, or any portion of Montana, is available at the local office of the Natural Resources Conservation Service.

---

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 Natural Resources Conservation Service has leadership for the Federal part of the National Cooperative Soil Survey.

Major fieldwork for this soil survey was completed in 1985. Soil names and descriptions were approved in 1990. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1985. This survey was made cooperatively by the Natural Resources Conservation Service; the United States Department of the Interior, Bureau of Indian Affairs; and the Montana Agricultural Experiment Station.. It is part of the technical assistance furnished to the Lake County Conservation District. Financial assistance was furnished by the Board of county Commissioners, Lake County, and the Bureau of Indian Affairs.

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.

All programs and services of the Natural Resources Conservation Service are offered on a nondiscriminatory basis, without regard to race, color, national origin, religion, sex, age, marital status, or handicap.

# Contents

---

## Part I

Index to taxonomic units .....	iv
Index to map units .....	v
Summary of tables .....	x
Foreword .....	xiii
How this survey was made .....	1
General nature of the survey area .....	2
History .....	2
Transportation .....	3
Physiography, drainage, and geology .....	3
Climate .....	5
Formation and classification of the soils .....	9
Soil series and detailed map units .....	17
References .....	177
Glossary .....	179

## Part II (For page numbers, see Contents in Part II)

### Detailed soil map unit legend

#### Summary of tables

#### Agronomy

- Cropland limitations and hazards
- Crop yield estimates
- Land capability classification
- Prime farmland and other important farmland

#### Erosion factors

- Crops and pasture, and erosion control in Lake County area

#### Range

- Range condition
- Rangeland management
- Forest land understory vegetation

#### Forest land

- Woodland ordination system
- Forest land management and productivity

#### Recreation

#### Wildlife habitat

- Elements of wildlife habitat
- Kinds of wildlife
- Wildlife of Lake County Area

#### Engineering

- Building site development
- Sanitary facilities
- Waste management
- Construction materials
- Water management

#### Soil properties

- Engineering index properties
- Physical and chemical properties
- Water features
- Soil features

#### References

#### Glossary

# Index To Taxonomic Units

---

Aeric Haplaquepts.....	18	Marklepass series .....	97
Bata series.....	19	McCollum series .....	100
Belton series .....	21	McDonald series .....	102
Bigarm series.....	24	Minesinger series .....	106
Bohnly series.....	30	Mitten series .....	108
Bolack series .....	31	Moiese series .....	111
Borohemists .....	32	Mollman series .....	113
Bowlake series .....	33	Niarada series.....	116
Colake series.....	35	Ninepipe series .....	120
Connah series.....	38	Phillcher series.....	121
Courville series .....	40	Polson series .....	123
Craddock series .....	45	Post series .....	126
Doker series .....	48	Repp series .....	130
Dryfork series.....	49	Ronan series.....	132
Dubay series .....	52	Round Butte series.....	134
Eaglewing series .....	54	Rumblecreek series .....	139
Esteslake series .....	56	Sacheen series .....	142
Felan series.....	57	Selon series.....	143
Finleypoint series .....	59	Selow series.....	146
Flott series .....	64	Sharrott series.....	148
Gardencreek series .....	67	Tevis series.....	149
Gird series.....	68	Trapps series.....	150
Glaciercreek series.....	72	Truscreek series .....	152
Half Moon series.....	73	Typic Haplaquepts .....	155
Hogsby series.....	75	Vincom series.....	156
Holloway series .....	77	Waldbillig series.....	158
Irvine series.....	81	Walstead series .....	160
Jocko series .....	83	Whitearth series .....	163
Kerl series.....	86	Wildgen series .....	164
Kerrdam series .....	88	Winfall series.....	167
Kingspoint series.....	91	Winkler series.....	169
Lamoose series.....	93	Xerofluvents.....	172
Lonepine series.....	94	Yellowbay series.....	173

# Index to Map Units

---

1--Aeric Haplaquepts, 1 to 3 percent slopes....	18	26--Connah silt loam, 0 to 2 percent slopes.....	39
2--Badland .....	19	27--Connah-Water complex, 2 to 4 percent slopes.....	40
3--Bata gravelly silt loam, 8 to 30 percent slopes.....	20	28--Courville gravelly silt loam, 4 to 15 percent slopes.....	42
4--Bata gravelly silt loam, 30 to 60 percent slopes.....	21	29--Courville gravelly silt loam, 15 to 30 percent slopes.....	42
5--Belton silt loam, 0 to 2 percent slopes .....	22	30--Courville gravelly silt loam, 30 to 60 percent slopes.....	43
6--Belton silt loam, 8 to 15 percent slopes.....	23	31--Courville gravelly silt loam, warm, 4 to 15 percent slopes.....	43
7--Belton silt loam, 15 to 35 percent slopes.....	23	32--Courville gravelly silt loam, warm, 15 to 30 percent slopes .....	44
8--Belton-Kerl silt loams, 2 to 4 percent slopes.....	24	33--Courville gravelly silt loam, warm, 30 to 60 percent slopes .....	44
9--Belton-Kerl silt loams, 4 to 8 percent slopes.....	24	34--Courville-Rumblecreek complex, 8 to 30 percent slopes.....	45
10--Bigarm cobbly loam, 15 to 30 percent slopes.....	26	35--Craddock channery silt loam, 30 to 60 percent slopes.....	46
11--Bigarm cobbly loam, cool, 15 to 30 percent slopes.....	26	36--Craddock silt loam, 4 to 15 percent slopes.....	47
12--Bigarm gravelly loam, 8 to 15 percent slopes.....	27	37--Craddock silt loam, 15 to 30 percent slopes.....	47
13--Bigarm, cool-Hogsby-Rock outcrop complex, 30 to 60 percent slopes .....	27	38--Doker silt loam, 0 to 2 percent slopes.....	49
14--Bigarm, cool-Rubble land complex, 30 to 60 percent slopes .....	28	39--Dryfork silt loam, 0 to 4 percent slopes.....	50
15--Bigarm-Hogsby-Rock outcrop complex, 30 to 60 percent slopes .....	28	40--Dryfork-Selow complex, 0 to 4 percent slopes.....	50
16--Bigarm-Rock outcrop-Rubble land complex, 30 to 60 percent slopes .....	29	41--Dryfork-Selow complex, 4 to 15 percent slopes.....	51
17--Bohnly silt loam, 0 to 2 percent slopes.....	31	42--Dubay silt loam, 0 to 2 percent slopes.....	52
18--Bolack silt loam, 0 to 2 percent slopes.....	32	43--Dubay silt loam, 2 to 6 percent slopes.....	53
19--Borohemists, 0 to 1 percent slopes.....	33	44--Eaglewing gravelly silt loam, 8 to 15 percent slopes.....	53
20--Bowlake gravelly loam, 4 to 8 percent slopes.....	34	45--Eaglewing gravelly silt loam, 15 to 30 percent slopes.....	54
21--Bowlake-Minesinger gravelly loams, 8 to 15 percent slopes .....	35	46--Eaglewing silt loam, 2 to 8 percent slopes.....	55
22--Colake silt loam, 0 to 1 percent slopes.....	36	47--Esteslake-Slickspots complex, 0 to 4 percent slopes.....	57
23--Colake silt loam, drained, 0 to 1 percent slopes.....	37		
24--Colake-Sacheen complex, 0 to 3 percent slopes.....	37		
25--Connah cobbly silt loam, 4 to 8 percent slopes.....	39		

48--Felan gravelly silt loam, 15 to 30 percent slopes.....	58	70--Half Moon-Courville complex, 4 to 15 percent slopes .....	75
49--Felan gravelly silt loam, 30 to 60 percent slopes.....	59	71--Hogsby-Finleypoint gravelly loams, 30 to 60 percent slopes .....	76
50--Finleypoint cobbly loam, 2 to 8 percent slopes.....	60	72--Hogsby-Rock outcrop complex, 15 to 45 percent slopes .....	77
51--Finleypoint cobbly loam, 8 to 15 percent slopes.....	61	73--Holloway gravelly silt loam, 15 to 30 percent slopes .....	78
52--Finleypoint gravelly loam, 15 to 30 percent slopes.....	61	74--Holloway gravelly silt loam, 30 to 60 percent slopes .....	79
53--Finleypoint gravelly loam, 30 to 60 percent slopes.....	62	75--Holloway gravelly silt loam, cool, 15 to 30 percent slopes .....	79
54--Finleypoint gravelly loam, dry, 15 to 30 percent slopes .....	62	76--Holloway gravelly silt loam, cool, 30 to 60 percent slopes .....	80
55--Finleypoint very gravelly loam, dry, 30 to 60 percent slopes .....	63	77--Holloway, dry-Rock outcrop complex, 15 to 30 percent slopes .....	80
56--Finleypoint-Wildgen gravelly loams, 30 to 60 percent slopes .....	63	78--Holloway-Rubble land complex, 45 to 75 percent slopes .....	81
57--Flott gravelly loam, 2 to 8 percent slopes.....	65	79--Irvine silty clay, 8 to 15 percent slopes.....	82
58--Flott gravelly loam, 8 to 15 percent slopes.....	65	80--Irvine silty clay, 15 to 60 percent slopes.....	83
59--Flott gravelly loam, 15 to 30 percent slopes.....	66	81--Jocko gravelly loam, 0 to 4 percent slopes.....	84
60--Flott gravelly loam, 30 to 60 percent slopes.....	66	82--Jocko gravelly loam, 4 to 15 percent slopes .....	85
61--Flott very gravelly loam, dry, 30 to 60 percent slopes .....	67	83--Jocko very stony sandy loam, 0 to 8 percent slopes .....	85
62--Gardencreek silty clay loam, 0 to 2 percent slopes .....	68	84--Kerl loam, 2 to 4 percent slopes .....	87
63--Gird silt loam, 0 to 2 percent slopes.....	69	85--Kerl loam, 4 to 8 percent slopes .....	87
64--Gird silt loam, 2 to 4 percent slopes.....	70	86--Kerrdam silt loam, 0 to 2 percent slopes.....	88
65--Gird-Dryfork silt loams, moderately wet, 0 to 1 percent slopes .....	70	87--Kerrdam silt loam, 2 to 6 percent slopes.....	89
66--Gird-Vincom silt loams, 4 to 8 percent slopes .....	71	88--Kerrdam-Vincom silt loams, 6 to 15 percent slopes .....	89
67--Gird-Vincom silt loams, 8 to 15 percent slopes .....	71	89--Kerrdam-Vincom silt loams, 15 to 30 percent slopes .....	90
68--Glaciercreek gravelly silt loam, 2 to 4 percent slopes .....	73	90--Kingspoint gravelly loam, 4 to 15 percent slopes .....	92
69--Half Moon silt loam, 2 to 4 percent slopes .....	74	91--Kingspoint very gravelly loam, 15 to 30 percent slopes .....	92

92--Kingspoint very gravelly loam, 30 to 60 percent slopes .....	93	113--Mitten very gravelly silt loam, dry, 30 to 60 percent slopes .....	110
93--Lamoose loam, 0 to 2 percent slopes .....	94	114--Mitten, dry-Rock outcrop complex, 30 to 60 percent slopes .....	111
94--Lonepine silt loam, 0 to 2 percent slopes .....	95	115--Moiese loam, 0 to 2 percent slopes .....	112
95--Lonepine silt loam, 2 to 4 percent slopes .....	95	116--Mollman gravelly loam, 0 to 4 percent slopes .....	114
96--Lonepine silt loam, dry, 2 to 8 percent slopes .....	96	117--Mollman gravelly loam, 4 to 15 percent slopes .....	114
97--Lonepine-Vincom silt loams, 4 to 8 percent slopes .....	96	118--Mollman gravelly loam, 15 to 30 percent slopes .....	115
98--Lonepine-Vincom silt loams, dry, 4 to 15 percent slopes .....	97	119--Mollman very gravelly loam, 30 to 60 percent slopes .....	115
99--Marklepass silty clay loam, 0 to 2 percent slopes .....	99	120--Niarada gravelly loam, 0 to 4 percent slopes .....	117
100--Marklepass-Slickspots complex, 0 to 2 percent slopes .....	99	121--Niarada gravelly loam, 4 to 8 percent slopes .....	117
101--McCollum fine sandy loam, 0 to 2 percent slopes .....	101	122--Niarada gravelly loam, 8 to 15 percent slopes .....	118
102--McCollum fine sandy loam, 2 to 4 percent slopes .....	101	123--Niarada gravelly loam, cool, 15 to 30 percent slopes .....	118
103--McCollum fine sandy loam, 4 to 8 percent slopes .....	101	124--Niarada gravelly loam, cool, 30 to 60 percent slopes .....	119
104--McCollum fine sandy loam, gravelly substratum, 0 to 2 percent slopes .....	102	125--Niarada-Kerl complex, 8 to 15 percent slopes .....	119
105--McDonald cobbly silty clay loam, 2 to 4 percent slopes .....	104	126--Ninepipe silt loam, 0 to 2 percent slopes .....	121
106--McDonald cobbly silty clay loam, 4 to 8 percent slopes .....	104	127--Phillcher gravelly silt loam, 15 to 45 percent slopes .....	122
107--McDonald cobbly silty clay loam, 8 to 15 percent slopes .....	105	128--Phillcher-Rock outcrop complex, 45 to 75 percent slopes .....	122
108--McDonald silty clay loam, 0 to 2 percent slopes .....	105	129--Pits, gravel .....	123
109--Minesinger stony loam, 4 to 15 percent slopes .....	107	130--Polson silt loam, 0 to 2 percent slopes .....	124
110--Minesinger-Walstead very stony loams, 15 to 45 percent slopes .....	107	131--Polson silt loam, 2 to 4 percent slopes .....	125
111--Mitten gravelly silt loam, 8 to 30 percent slopes .....	109	132--Polson-Vincom silt loams, 4 to 8 percent slopes .....	125
112--Mitten very gravelly silt loam, 30 to 60 percent slopes .....	110	133--Post silt loam, 0 to 2 percent slopes .....	127
		134--Post silty clay loam, 2 to 4 percent slopes .....	128

135--Post silty clay loam, 4 to 8 percent slopes.....	128	156--Selon fine sandy loam, 0 to 2 percent slopes.....	144
136--Post-Ronan-Water complex, 2 to 8 percent slopes.....	129	157--Selon fine sandy loam, 2 to 4 percent slopes.....	145
137--Post-Ronan-Water complex, 8 to 15 percent slopes.....	129	158--Selon fine sandy loam, 4 to 8 percent slopes.....	145
138--Repp gravelly loam, 30 to 60 percent slopes.....	131	159--Selon sandy loam, 8 to 15 percent slopes.....	146
139--Repp, cool-Rock outcrop complex, 30 to 60 percent slopes.....	131	160--Selow silty clay loam, 0 to 2 percent slopes.....	147
140--Rock outcrop-Rubble land complex.....	132	161--Selow silty clay loam, 2 to 4 percent slopes.....	147
141--Ronan silty clay loam, 0 to 2 percent slopes.....	133	162--Tevis very gravelly loam, 30 to 60 percent slopes.....	150
142--Ronan silty clay loam, 2 to 4 percent slopes.....	134	163--Trapps gravelly loam, 8 to 15 percent slopes.....	151
143--Ronan silty clay loam, 4 to 8 percent slopes.....	134	164--Trapps gravelly loam, 15 to 30 percent slopes.....	152
144--Round Butte silty clay loam, 0 to 2 percent slopes.....	136	165--Truscreek silt loam, 0 to 2 percent slopes.....	153
145--Round Butte silty clay loam, 2 to 4 percent slopes.....	136	166--Truscreek-Polson silt loams, 0 to 2 percent slopes.....	153
146--Round Butte silty clay loam, 4 to 8 percent slopes.....	137	167--Truscreek-Polson silt loams, 2 to 4 percent slopes.....	154
147--Round Butte silty clay loam, dry, 0 to 2 percent slopes.....	137	168--Truscreek-Polson silt loams, 4 to 8 percent slopes.....	154
148--Round Butte-Irvine silty clay loams, 2 to 8 percent slopes.....	138	169--Typic Haplaquepts, 0 to 2 percent slopes.....	156
149--Round Butte-Irvine silty clay loams, dry, 4 to 15 percent slopes.....	138	170--Vincom silt loam, 15 to 60 percent slopes.....	157
150--Rumblecreek gravelly loam, 2 to 8 percent slopes.....	140	171--Vincom-Lonepine silt loams, 8 to 15 percent slopes.....	157
151--Rumblecreek gravelly loam, 8 to 15 percent slopes.....	140	172--Waldbillig gravelly silt loam, 15 to 30 percent slopes.....	159
152--Rumblecreek gravelly loam, 15 to 30 percent slopes.....	141	173--Waldbillig gravelly silt loam, 30 to 60 percent slopes.....	159
153--Rumblecreek gravelly loam, 30 to 60 percent slopes.....	141	174--Walstead gravelly loam, 0 to 2 percent slopes.....	161
154--Sacheen fine sand, hummocky, 3 to 10 percent slopes.....	142	175--Walstead gravelly loam, 2 to 4 percent slopes.....	161
155--Sacheen loamy fine sand, 0 to 8 percent slopes.....	143	176--Walstead gravelly loam, 4 to 15 percent slopes.....	162

---

177--Walstead-Rock outcrop complex, 15 to 30 percent slopes .....	162	186--Winkler very gravelly loam, cool, 30 to 60 percent slopes .....	171
178--Whitearth-Esteslake complex, 2 to 8 percent slopes .....	164	187--Winkler-Sharrott-Rock outcrop complex, 30 to 60 percent slopes .....	171
179--Wildgen gravelly loam, 8 to 30 percent slopes.....	165	188--Xerofluvents, 0 to 2 percent slopes.....	172
180--Wildgen very gravelly loam, 30 to 60 percent slopes .....	166	189--Xerofluvents, dry, 0 to 2 percent slopes.....	173
181--Wildgen-Finleypoint gravelly loams, 15 to 30 percent slopes .....	166	190--Yellowbay very gravelly loam, 0 to 4 percent slopes .....	174
182--Winfall very gravelly loam, 4 to 15 percent slopes .....	168	191--Yellowbay very gravelly loam, 4 to 15 percent slopes .....	174
183--Winfall very gravelly loam, 15 to 30 percent slopes .....	168	192--Yellowbay very gravelly loam, 15 to 30 percent slopes .....	175
184--Winfall very gravelly loam, 30 to 60 percent slopes .....	169	M-W--Miscellaneous water.....	108
185--Winkler, cool-Rock outcrop complex, 30 to 60 percent slopes .....	170	W--Water .....	163

# Summary of Tables

---

## Part I

Temperature and precipitation .....	6
Freeze dates in spring and fall .....	7
Growing season.....	8
Classification of the soils .....	12
Acreage and proportionate extent of the soils .....	13

## Part II

(Page numbers are in "Summary of Tables" in part II)

Classification of the soils	
Acreage and proportionate extent of the soils	
Main cropland limitations and hazards	
Land capability and yields per acre of crops	
Prime farmland	
Rangeland productivity and characteristic plant communities	
Forest land understory vegetation and habitat types	
Forest land management	
Forest land productivity	
Main forest access road limitations and hazards	
Recreational development	
Building site development	
Sanitary facilities	

---

Construction materials

Water management

Engineering index properties

Physical properties of the soils

Chemical properties of the soils

Water features

Soil features



# Foreword

---

This soil survey contains information that can be used in land-planning programs in the Lake County area. 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 ensure 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 Natural Resources Conservation Service or the Cooperative Extension Service.

Richard J. Gooby  
State Conservationist  
Natural Resources Conservation Service



# Soil Survey of Lake County Area, Montana

---

Fieldwork by Robert R. Boast, John R. Cloninger, Brian D. Dougherty,  
Merv Haub, John B. Seago, and Ron Shelito, Natural Resources Conservation  
Service

United States Department of Agriculture, Natural Resources Conservation  
Service,  
in cooperation with the United States Department of Interior, Bureau of  
Indian Affairs, and the Montana Agricultural Experiment Station

## How This Survey Was Made

This survey was made to provide information about the soils and miscellaneous areas in the survey area. The information includes a description of the soils and miscellaneous areas and their location and a discussion of their suitability, limitations, and management for specified uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They dug many holes to study the soil profile, which is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

The soils and miscellaneous areas in the survey area are in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind or segment of the landscape. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landscape, soil scientists develop a concept, or model, of how the soils were formed. Thus, during mapping, this model enables

the soil scientists to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Individual soils on the landscape commonly merge into one another as their characteristics gradually change. To construct an accurate map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and

character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

The descriptions, names, and delineations of the soils in this survey area do not fully agree with those of the soils in adjacent survey areas. Differences are the result of a better knowledge of soils, modifications in series concepts, or variations in the intensity of mapping or in the extent of the soils in the survey areas.

## General Nature of the Survey Area

This soil survey updates an older survey, "Soil Survey of the Lower Flathead Valley Area, Montana," published in 1929. It provides additional information and has larger maps showing the soils in greater detail.

Lake County area is in northwestern Montana. The eastern part of the survey area is characterized by the Mission Mountains, and the western part by the steeply sloping Salish-Kootenee Mountains. The central part of the area is characterized by a broad glaciated valley of glacial till, glacial outwash, and glacial lacustrine deposits. This part includes level to strongly sloping alluvial fans, stream terraces, and rough badlands along the Flathead River.

The soil survey area includes about 728,130 acres, or 1,169 square miles. About 21 percent is forest land, 20 percent range, 19 percent cropland and pasture, and 13 percent water. The remaining 25 percent consists of federal land, urban and built-up areas, farmsteads, and feedlots.

## History

Three major Indian tribes have historically occupied this area--the Kalispell, or Upper Pend'Oreille; the Salish, more commonly known as the Flatheads; and the Kootenai. In the early 1800s Europeans arrived in the area. They were French and English fur traders. These traders established the Hudson Bay Fur Company at Fort Connah in 1854. It was located about 6 miles north of the present town of St. Ignatius.

In 1855 Flathead Indian Reservation was established for the Kalispell and Kootenai Tribes. In 1871 a presidential order was issued decreeing the Salish Tribe would also be included.

The Dawes Act of 1887 opened the reservation to settlement from outside the tribes. In 1904 Congress passed a bill authorizing surveys of reservation lands, with allotments being given to tribal members. In 1909 names were drawn from a lottery allowing 403 settlers to homestead on the reservation.

Additionally, in 1904 a congressional bill authorized a preliminary survey of the area to determine whether an irrigation project would be feasible. A favorable report was submitted and construction began in 1909. In 1917, 1928, and

1935, additional congressional appropriations for the Flathead Irrigation project were made, furthering stimulation for settlement of the area.

Lake County was formed in 1923 from portions of Missoula and Flathead Counties. The population had grown to 9,451 by 1930, with an increase to 13,490 by 1940 and 13,835 by 1950. In 1960 the population had decreased to 13,104 but grew again by 1970 to 14,300. By 1980 it was 19,056 and in 1990 it had grown to 21,041.

## **Transportation**

U.S. Highway 93 enters the survey area just southeast of Arlee and proceeds in a northerly course through the major towns. It exits toward Kalispell in the north-central part of the survey area. U. S. Highway 10A duplicates U.S. 93 from the southern boundary to Ravalli, at which point it exits to the west. Montana Highway 35 junctions with U. S. 93 at Polson. It then follows the east shore of Flathead Lake to the northern boundary of the area at Big Fork. In addition to main highways there are many improved county roads which provide accessibility to the populated rural areas.

In the southern end of the area the main line of Burlington Northern Railway passes through Arlee and Ravalli. Also, a freight line from this railway serves the towns of Charlo, Ronan, Pablo, and Polson.

Small aircraft landing strips are located near the towns of St. Ignatius, Ronan, and Polson. The field at Polson will accommodate small multi-engine planes. Passenger buses and freight lines also service the towns along U. S. Highway 93.

## **Physiography, Drainage, and Geology**

Lake County area is in the Northern Rocky Mountain physiographic province, near the southern end of a feature known as the Rocky Mountain Trench. The survey area is almost entirely in the Rocky Mountain Trench but also includes a fringe of mountainous land on the eastern side, some rough country west of Flathead Lake, and mountains in the southern tip of the area.

Maximum total relief in the survey area is about 4,100 feet. It is between 2,892 feet at Flathead Lake to the highest point of 7,000 feet, in the southeastern corner of Section 13, Township 16 North, Range 19 West. Local relief of about 1,500 feet is the highest between Flathead Lake and an area about 4 miles south of Wild Horse Island. Many areas have less than 40 feet of relief

per 1 square mile. Average relief is somewhere between these two extremes.

Most of the survey area lies south of Flathead Lake in the Flathead Valley. The Mission Range rises sharply from the east side of the valley and Salish Mountains flank the west side of the area. Flathead Valley is a broad area of low to moderate relief with abundant small ponds and reservoirs. Flathead Lake occupies a sizable area in the northern part of the area. Lake Mary Ronan is a smaller lake in the northwest corner of the area. Pablo Reservoir, Kicking Horse Reservoir, Ninepipe Reservoir, Lower Crow Reservoir, and Mission Reservoir are major water storage projects in the valley.

Flathead River flows out of the southern end of Flathead Lake. With its tributaries it drains all the survey area. It marks the boundary between Lake County and Sanders County for several miles. Jocko River and its tributaries drain the southern most part of the survey area and joins Flathead river a few miles after it leaves Lake County. Mission Creek, Crow Creek, and their tributaries are other drainages of the southern part of the area. They empty into Flathead River. White Earth Creek empties into Flathead River from the west, about 15 miles downstream from Flathead Lake. Dayton Creek drains the northwest corner of the area into the Flathead Lake. The Little Bitterroot River is joined by several tributaries that drain small areas along the western edge of the area. It then empties into Flathead River about 4 miles southwest of the Round Butte community.

Nearly all the indurated rocks cropping out in the survey area belong to Belt Supergroup of Middle Proterozoic age (Precambrian). Lithologies include quartzite, siltite, argillite, and dolomite. All of which show some degree of metamorphism. These rock types are resistant to erosion and form prominent hills and mountains in the area.

East of Flathead Lake rocks of the Spokane, Empire, and Helena Formations crop out. These same formations also crop out west of the lake. Further west the Burke and Revett Formations occur. In the far northwest corner a small area of Tertiary granite and another of Tertiary volcanics crop out. These are the only two examples of resistant rocks known to occur in the area, not belonging to the Belt Supergroup.

Outcrops of Burke, Revett, and Spokane Formations continue southward into Township 21 North, at the survey area line. Small areas of both Upper Prichard and Lower Prichard crop out along the valley of the Little Bitterroot River.

A low range of hills extending southwest from Pablo Reservoir have outcrops of Burke, Revett,

Spokane, and Empire rocks. Burke and Revett Formations crop out in the Moiese Hills, located a few miles further south.

Empire and Helena rocks crop out at the east end of the area, south of Jocko River. Helena, Snowslip, Shepard, and Mount Shields are located in the western part of the area.

Complex outcrop patterns in a small range of mountains form the divide between Jocko River and the Mission Creek drainage. The eastern end of the range has areas of Spokane, Empire, Helena, Snowslip, Shepard, Mount Shields, and Bonner. In the western part, areas of Revett, St. Regis, Empire, Helena, Snowslip, and Mount Shields occur.

The eastern margin of the survey area, south of Flathead Lake, borders on the Mission Range. Spokane and Empire Formations crop out on the western flank of the Mission Range and are present in other small areas of the survey.

Younger materials blanket the bottom of the Rocky Mountain Trench. Pleistocene sediments occupy the largest area. Glacial till, end moraines, outwash, and other glaciofluvial and flood deposits are all present, but not differentiated. Extensive lacustrine deposits approximately follow the Flathead River valley and extend up the White Earth Creek drainage, Mission Creek drainage, and the Jocko River valley. Buff to lavender colored varved clay was deposited in Pleistocene Lake Missoula; along with silt containing a few lenses of gravel and occasional drop-stones. Narrow bands of Holocene alluvium are present in major stream valleys but are most prominent along the Flathead and Jocko Rivers. Prominent vertical cliffs are often present where modern stream valleys cut downward into Pleistocene lake sediments. Total thickness of Quaternary sediments is not known but is probably many hundreds, and possibly more than a thousand feet thick.

None of the Quaternary sediments are lithified. This is in contrast to rocks of the Belt Supergroup which are not only lithified but mildly metamorphosed, hard, and very resistant to erosion. This conspicuous difference in susceptibility to erosion accounts for the diversity of landscapes typical for the area.

A major anticline trends approximately northward from the southwest corner of Township 19 North, Range 21 West, to a point about 5 miles west of Elmo where it enters a prominent east-west valley. This valley follows the Big Draw Fault which offsets the anticline eastward, to a point less than a mile east of Elmo where it continues northward. West of the

anticline are smaller and less continuous synclines that are nearly parallel. Another north-south anticline is mapped along the east side of the East Bay on Flathead Lake, and continues just east of Finley Point.

Two prominent sets of faults are mapped within the survey area. One set is near Flathead Lake and extends southward to the Moiese Hills, trending nearly north and south. Faults belonging to this set are also mapped along the east side of Flathead Lake and in the Mission Range, east of the survey area. The other set trends northwest-southeast and is in much of the rest of the survey area. The two sets intersect in places and occasional faults follow other trends. Big Draw Fault in the northern part of the area and St. Marys Fault in the southern part of the area are important examples of strike-slip faults trending nearly east and west. All faults within the area have normal displacement, strike-slip displacement, or a combination of the two. Although thrust faults were mapped just west of Little Bitterroot River, there are none known in the Lake County area. It has been postulated that the Rocky Mountain Trench is a great down-faulted block.

Near neighbors of the survey area are Sanders County, Lincoln County, and Flathead County. All have enjoyed mineral production, but this survey area has not been noted for mineral resources. Minor amounts of silver, copper, and lead have been produced but never warranted continued production or exploration. There is a small possibility of finding stratiform deposits of copper or silver-lead-zinc in some of the Belt rocks of the area.

There has been little exploration for petroleum resources in the area. There was a flurry of activity during the early 1980s. However, it did not result in enough encouragement to carry forward during the low ebb of oil and gas activity in the latter part of the decade.

Surface waters are a major resource in the area. Numerous lakes, ponds, and streams represent an extensive supply of water for recreation and other uses.

Ground water resources in the survey area are highly variable. Shallow, alluvial aquifers are a dependable source of water within the confines of major stream valleys, but many areas are commonly polluted with nitrates and other chemicals. Gravels within Pleistocene till furnish a deeper source of high quality water but their distribution is not well known. Deposited in outwash channels and local outwash plains, they are presumably at various depths within the

several hundred feet of glacial till. The valley west of Elmo was probably a side-channel that developed when glacial ice filled the lowland of Flathead Valley. Filled with coarse gravels, it is capable of furnishing an adequate supply of groundwater. These gravels seem to be drained by gravity flow, probably into other gravels at lower elevations, and provide water only from the deepest part of the deposits. Although glacial gravels are inadequately known, they probably contain large quantities of high quality groundwater. The search for this resource is expensive. The cost of drilling wells is high and a considerable risk factor is involved. Shallow geophysical data may be valuable in finding these elusive aquifers.

A number of wells produce water of excellent quality from Belt rocks. Although these rocks are hard and dense, fracturing near fault zones renders them permeable enough to provide satisfactory quantities of water. At lower elevations these wells usually flow about 5-gallons per minute for each 100 feet of penetration. Drilling through these hard rocks is expensive but water is available, and a valuable potential resource. About 13 percent of the survey area is covered by water from lakes, ponds, and streams.

## **Climate**

Lake County area summers are warm to hot in most valleys and much cooler in the mountains. Winters are cold in the mountains. Valleys are cooler than the lower slopes of adjacent mountains because of cold air drainage. Precipitation occurs in the mountains throughout the year and a deep snowpack accumulates during winter. Snowmelt usually supplies much

more water than can be used for agriculture in the area. In the valleys, precipitation during summer falls as showers, however, some thunderstorms do occur. In winter the ground is covered with snow much of the time. Chinook winds, which blow downslope and are warm and dry, often melt and evaporate the snow.

The "Temperature and Precipitation" table gives data for the survey area as recorded at Bigfork, Polson, and Saint Ignatius, Montana, for the period 1961 to 1990. The "Freeze Dates in Spring and Fall" table shows probable dates of the first freeze in fall and the last freeze in spring. The "Growing Season" table provides data on probable length of the growing season.

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

The total average annual precipitation is about 22 inches at Bigfork, about 16 inches at Polson, and about 17 inches at Saint Ignatius. Of this, 60 to 70 percent usually falls in April through September and includes the growing season for most crops. Thunderstorms occur approximately 25 days each year, occurring mostly in the summer.

Average relative humidity in mid-afternoon is about 50 percent. Humidity is higher at night with the average at dawn being about 80 percent. The percentage of possible sunshine is 70 percent in summer and 30 percent in winter. The prevailing wind is from the northwest. The average windspeed is highest in spring at 8 miles per hour.

TEMPERATURE AND PRECIPITATION

(Recorded in the period 1961 to 1990 at Bigfork; Polson; and Saint Ignatius)

Month	Temperature (Degrees F.)					Precipitation					
	Average daily maximum	Average daily minimum	Average	2 years in 10 will have--		Average number of growing degree days*	Average (in.)	2 years in 10 will have--		Average number of days with 0.10 inch or more	Average total snow fall (in.)
				max. temp more than	min. temp less than			Less than (in.)	More than (in.)		
<b>BIGFORK:</b>											
January---	33.2	21.6	27.4	54	-5	6	1.94	1.01	2.76	6	15.3
February--	37.6	24.3	31.0	56	-3	8	1.18	0.71	1.60	4	8.3
March-----	44.5	27.9	36.2	64	5	26	1.55	0.92	2.11	5	5.7
April-----	54.9	33.8	44.4	75	21	133	1.48	0.82	2.17	4	0.7
May-----	63.8	40.3	52.0	84	28	339	2.73	1.48	3.84	6	0.3
June-----	71.7	47.4	59.6	89	35	535	3.00	1.69	4.16	6	0.0
July-----	80.0	51.9	65.9	94	40	589	1.56	0.47	2.57	4	0.0
August-----	79.1	51.1	65.1	96	40	559	1.85	0.59	3.01	4	0.0
September--	66.9	42.9	54.9	86	28	366	2.07	1.07	3.10	5	0.0
October-----	55.1	36.1	45.6	75	20	169	1.33	0.68	2.06	3	0.0
November---	41.5	29.6	35.5	60	8	29	1.66	0.89	2.34	5	5.1
December--	34.3	23.2	28.8	53	-9	9	2.11	1.10	2.99	7	13.4
Yearly:											
Average--	55.2	35.8	45.5	----	----	----	----	----	----	----	----
Extreme--	101	-27	----	96	-13	----	----	----	----	----	----
Total----	----	----	----	----	----	2,768	22.47	15.89	25.92	59	48.8
<b>POLSON:</b>											
January---	32.4	20.0	26.2	52	-9	5	1.02	0.49	1.48	3	5.4
February--	39.2	24.3	31.8	57	-5	11	0.83	0.36	1.23	3	3.4
March-----	46.1	27.7	36.9	65	3	35	1.05	0.61	1.44	4	1.7
April-----	57.0	34.4	45.7	76	20	165	1.37	0.68	1.97	4	0.2
May-----	64.8	40.8	52.8	86	27	348	2.38	1.25	3.36	5	0.0
June-----	74.0	48.0	61.0	91	35	555	2.06	1.12	2.89	5	0.0
July-----	81.9	52.5	67.2	95	40	766	1.19	0.44	1.82	3	0.0
August-----	80.9	52.5	66.7	96	40	754	1.57	0.85	2.20	4	0.0
September--	68.6	43.6	56.1	88	28	422	1.61	0.85	2.28	4	0.0
October-----	57.0	35.7	46.4	78	20	187	0.86	0.34	1.43	2	0.0
November---	41.9	28.3	35.1	63	5	35	1.10	0.63	1.51	3	3.9
December--	33.5	21.2	27.3	55	-11	10	1.26	0.55	1.86	4	5.5
Yearly:											
Average--	56.5	35.7	46.1	----	----	----	----	----	----	----	----
Extreme--	101	-25	----	101	-18	----	----	----	----	----	----
Total----	----	----	----	----	----	3,298	16.29	9.44	19.33	44	20.1
<b>SAINT IGNATIUS:</b>											
January---	33.0	17.9	25.4	55	-18	10	1.14	0.48	1.69	3	12.9
February--	39.8	22.4	31.1	60	-10	17	0.70	0.37	1.00	2	7.0
March-----	48.3	26.4	37.4	69	-2	56	1.18	0.67	1.63	4	7.3
April-----	58.8	32.5	45.6	80	18	188	1.37	0.73	1.94	4	1.9
May-----	67.7	39.1	53.4	87	26	416	2.46	1.17	3.58	6	0.3
June-----	76.4	46.0	61.2	94	33	613	2.55	1.31	3.63	6	0.0
July-----	84.5	49.0	66.8	97	36	802	1.24	0.41	2.00	3	0.0
August-----	83.6	48.2	65.9	98	37	803	1.35	0.50	2.13	3	0.0
September--	71.2	40.7	56.0	90	25	479	1.50	0.75	2.25	4	0.1
October-----	58.2	32.8	45.5	79	16	195	1.06	0.44	1.58	3	0.7
November---	42.9	26.2	34.5	65	0	38	0.99	0.48	1.43	3	5.9
December--	34.1	19.3	26.7	57	-17	13	1.13	0.65	1.57	3	12.6
Yearly:											
Average--	58.2	33.4	45.8	----	----	----	----	----	----	----	----
Extreme--	102	-33	----	99	-25	----	----	----	----	----	----
Total----	----	----	----	----	----	3,630	16.67	13.85	19.12	44	48.7

\* A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (40.0 deg. F)

FREEZE DATES IN SPRING AND FALL

(Recorded in the period 1961 to 1990 at Bigfork; Polson; and Saint Ignatius)

Probability	Temperature		
	24 degrees F or lower	28 degrees F or lower	32 degrees F or lower
<b>BIGFORK:</b>			
Last freezing temperature in spring: January-July			
1 year in 10 later than-----	April 18	May 3	May 20
2 years in 10 later than----	April 10	April 20	May 16
5 years in 10 later than----	March 27	April 20	May 8
First freezing temperature in fall: August-Dec.			
1 year in 10 earlier than---	Oct. 9	Oct. 1	Sept. 13
2 years in 10 earlier than--	Oct. 18	Oct. 8	Sept. 19
5 years in 10 earlier than--	Nov. 5	Oct. 23	Oct. 2
<b>POLSON:</b>			
Last freezing temperature in spring: January-July			
1 year in 10 later than-----	April 29	May 10	May 21
2 years in 10 later than----	April 20	May 6	May 18
5 years in 10 later than----	April 2	April 28	
First freezing temperature in fall: August-Dec.			
1 year in 10 earlier than---	Oct. 4	Sept. 22	Sept. 12
2 years in 10 earlier than--	Oct. 11	Sept. 28	Sept. 16
5 years in 10 earlier than--	Oct. 25	Oct. 11	Sept. 26
<b>SAINT IGNATIUS:</b>			
Last freezing temperature in spring: January-July			
1 year in 10 later than-----	May 2	May 20	June 3
2 years in 10 later than----	April 26	May 15	May 30
5 years in 10 later than----	April 16	May 6	May 22
First freezing temperature in fall: August-Dec.			
1 year in 10 earlier than---	Sept. 23	Sept. 16	Sept. 2
2 years in 10 earlier than--	Sept. 30	Sept. 21	Sept. 7
5 years in 10 earlier than--	Oct. 12	Oct. 1	Sept. 17

GROWING SEASON

(Recorded in the period 1961-1990 at Bigfork; Polson; and Saint Ignatius)

Probability	Daily Minimum Temperature		
	Higher than 24 degrees F	Higher than 28 degrees F	Higher than 32 degrees F
	<u>Days</u>	<u>Days</u>	<u>Days</u>
<b>BIGFORK:</b>			
9 years in 10-----	170	149	119
8 years in 10-----	182	158	128
5 years in 10-----	203	175	144
2 years in 10-----	225	192	160
1 year in 10-----	236	201	169
<b>POLSON:</b>			
9 years in 10-----	157	142	118
8 years in 10-----	167	148	124
5 years in 10-----	188	158	135
2 years in 10-----	208	168	147
1 year in 10-----	219	174	153
<b>SAINT IGNATIUS:</b>			
9 years in 10-----	142	121	96
8 years in 10-----	150	128	103
5 years in 10-----	165	141	117
2 years in 10-----	179	154	132
1 year in 10-----	187	161	139

# Formation and Classification of the Soils

---

This section relates the soils in the survey area to the major factors of soil formation and describes the system of soil classification. The classification and extent of the soils in this survey area are shown in the tables "Classification of the Soils" and "Acreage and Proportionate Extent of the Soils," which are at the end of this section.

## Formation of the Soils

Soil is a natural, three dimensional body on the earth's surface. It has properties that result from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over a period of time.

Although there are many different soils, each soil is the result of the interaction of the same five factors. These factors are the physical and chemical composition of the parent material, the effect of climate on the parent material, the kinds of plants and the organisms living in the soil, the relief of the land, and the length of time it took for the soil to form.

Within short distances the combination of these factors varies, and consequently the soils that form differ in fertility, productivity, and physical and chemical characteristics. In the following paragraphs the factors of soil formation are discussed as they relate to the soils in the Lake County area.

## Climate

Climate, an active force in the formation of soils, is determined mainly by temperature and precipitation. In the Lake County area the winters are cold, springs are cool and moist, and summers are hot and dry. Erosion and alternate freezing and thawing break down rocks into material in which soils form. The weathered material is further broken down by chemical reactions such as solution and hydration.

The precipitation and temperature affect the kind and amount of vegetation that grows on the soil.

Vegetation decays to produce organic matter in the soil. Soils that have cool temperatures and high precipitation generally contain more organic matter and are dark colored. Soils with warm temperature and low precipitation generally contain less organic matter and are light colored.

## Living Organisms

Living organisms are active in the formation of soils. Plants, animals, insects, and micro-organisms affect gains or losses in organic matter, plant nutrients in the soil, and changes in porosity and structure.

Roots, rodents, and insects penetrate the soil and alter its structure. Leaves, roots, and entire plants that remain in the surface layer are changed to humus by microorganisms, chemicals in the soil, and insects. Fungi and algae also contribute to the decomposition of bedrock. Animals increase porosity by burrowing through the soil and leaving open channels for the movement of water and air. Common burrowing animals in the area are ground squirrels, mice, voles, badgers, and rabbits.

The vegetation in the survey area is mainly short grasses, mid grasses, and shrubs on the rangelands. Douglas fir, subalpine fir, and Grand fir with a shrub understory in the forests.

## Topography

Topography, or relief, in this survey area can be distinctively separated into mountains and intermountain valleys. The mountains rise 3,000 to 4,000 feet above the valleys and are moderately steep to very steep with numerous drainage ways. The valleys lying below the mountains are nearly level to gently sloping with occasional areas of steep hills.

Topography influences soil development through its effects on drainage and runoff. The topography of Lake County area closely affects the local climate. The amount of precipitation and air

temperatures can have wide variations within short distances.

In the mountains, generally, the depth to bedrock, amount of rock fragments, and the number and distinctness of soil horizons are affected by steepness and shape of slope. Soils on steep convex slopes generally have a greater amount of rock fragments, are shallower to bedrock, and have fewer and less distinct soil horizons. An example of this general principal is the Hogsby soil on very steep slopes.

In the valleys the number and distinctness of soil horizons generally decreases as the slope increases. Examples of this general principal are the Courville soils that are steep and very steep and the Belton soils that are nearly level to strongly sloping.

### **Parent Material**

The parent materials of the survey area are derived from various sources. Many sources include weathered material, transported by streams and glaciers, from various rock formations outside the area. Subsequently, the weathered material formed an unconsolidated mantle over the local bedrock formations.

At locations where the bedrock was not mantled, or where the mantle was removed by natural erosion processes, the soils formed from materials weathering in place. These materials include local argillites, quartzites, and impure limestones. The soils of these areas have surface layers of volcanic ash and are on cool, moist mountainsides. Most recently, ash was deposited to these areas by the 1980 eruption of Mount St. Helen. Approximate depths of ash are from 6 to 14 inches. An example is the Holloway series.

Other parent materials of the area are from glaciolacustrine sediments. These sediments consist of water-sorted material such as silty clays, silts, and sands. The finest textured materials are easily recognized. They were deposited in the calm, very deep waters of Glacial Lake Missoula. At its highest level this ancient lake was more than 1,100 feet deep, occurring at the southern end of what is now Flathead Lake. These finely textured materials consist of alternating, thin strata (varves) of silty clay and clay, which reduce soil permeability, and limit the soil depth and soil development.

### **Time**

The changes that take place in a soil over long periods of time are called soil genesis. Distinct horizons, or layers, develop in the soils as a result of these changes. The length of time that parent materials have been in place and exposed to climate and living organisms is generally reflected in the degree to which the soil profile has developed. The kinds and arrangement of layers are called the soil morphology, and they are described in terms of color, texture, structure, consistence, thickness, permeability, and chemistry.

Soils are classified as young to mature. The age of a soil is determined from the thickness of the A horizon, the content of clay and organic matter, the depth to which soluble material is leached, and the form and distribution of calcium carbonate and gypsum in the soil.

Young soils show very little profile development. Irvine silty clay, a soil of the Entisol order, is an example of a young soil. The soil contains little organic matter from which to form an A horizon, it has little clay accumulation, and little translocation of carbonates within the profile.

The Round Butte soil formed in parent material that is similar to that of the Irvine silty clay but is much older. These soils contain enough organic matter to have a dark colored A horizon, a distinct clay accumulation in a Bt horizon, and nearly all of the carbonates have been leached to a depth of about 12 inches.

Many of the sloping and steep, shallow and very shallow soils appear to have been in the process of formation for about as long as some of the more developed, less sloping soils. However, erosion has removed the soil as fast as it formed. In this case the effect of time has been offset by the effect of relief.

### **Classification of the Soils**

The system of soil classification used by the National Cooperative Soil Survey has six categories. 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. The categories are defined in the following paragraphs.

**ORDER.** Eleven 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 Mollisol.

**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 Boroll (*Bor*, meaning cool, plus *oll*, from Mollisol).

**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 Argiborolls (*Argi*, meaning having an argillic horizon, plus *boroll*, the suborder of the Mollisols that have a cool climate).

**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 *Typic* identifies the subgroup that typifies the great group. An example is Typic Argiborolls.

**FAMILY.** Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Generally, 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, thickness 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-silty, mixed, Typic Argiborolls.

**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. An example is the Winkler series.

CLASSIFICATION OF THE SOILS

Soil name	Family or higher taxonomic class
Aeric Haplaquepts-----	Aeric Haplaquepts
Bata-----	Loamy-skeletal, mixed Andic Cryoboralfs
Belton-----	Fine, illitic, frigid Typic Natrixerolls
Bigarm-----	Loamy-skeletal, mixed, frigid Typic Haploxerolls
Bohnlly-----	Fine-silty, mixed, frigid Typic Haplaquolls
Bolack-----	Fine, mixed, frigid Typic Haplaquolls
Borochemists-----	Borochemists
Bowlake-----	Fine, illitic, frigid Calcic Argixerolls
Colake-----	Fine-silty, frigid Typic Calciaquolls
Connah-----	Fine, illitic, frigid Typic Haploxeralfs
Courville-----	Loamy-skeletal, mixed, frigid Andic Eutrochrepts
Craddock-----	Coarse-loamy, mixed Andic Cryochrepts
Doker-----	Ashy over loamy, mixed frigid Typic Vitraquands
Dryfork-----	Coarse-silty, mixed, frigid Calcixerollic Xerochrepts
Dubay-----	Coarse-silty, mixed, frigid Typic Xerochrepts
Eaglewing-----	Fine-loamy, mixed, frigid Typic Ustochrepts
Esteslake-----	Fine, illitic, frigid Typic Natrixeralfs
Felan-----	Loamy-skeletal, mixed Andic Cryoboralfs
Finleypoint-----	Loamy-skeletal, mixed Udic Haploborolls
Flott-----	Loamy-skeletal, mixed Udic Haploborolls
Gardencreek-----	Fine, mixed, nonacid, frigid Aquic Xerofluvents
Gird-----	Coarse-silty, mixed, frigid Calcic Haploxerolls
Glaciercreek-----	Sandy-skeletal, mixed, frigid Andic Eutrochrepts
Half Moon-----	Fine-silty, mixed Glossic Eutroboralfs
*Hogsby-----	Loamy-skeletal, mixed, frigid Lithic Haploxerolls
Holloway-----	Loamy-skeletal, mixed Andic Cryochrepts
Irvine-----	Fine, illitic (calcareous), frigid Typic Xerorthents
Jocko-----	Sandy-skeletal, mixed, frigid Calcic Haploxerolls
Kerl-----	Fine-loamy, mixed, frigid Calcic Haploxerolls
Kerrdam-----	Coarse-silty, mixed, frigid Calcixerollic Xerochrepts
Kingspoint-----	Loamy-skeletal, mixed, frigid Typic Ustochrepts
Lamoose-----	Fine-loamy over sandy or sandy-skeletal, mixed (calcareous), frigid Typic Haplaquolls
Lonepine-----	Fine-silty, mixed, frigid Calcixerollic Xerochrepts
Marklepass-----	Fine, mixed, frigid Typic Natrixeralfs
McCollum-----	Coarse-loamy, mixed, frigid Typic Haploxerolls
McDonald-----	Fine, illitic Boralfic Argixerolls
Minesinger-----	Clayey-skeletal, mixed, frigid Typic Argixerolls
Mitten-----	Loamy-skeletal, mixed, frigid Andic Eutrochrepts
Moiese-----	Sandy-skeletal, mixed, frigid Calcic Haploxerolls
Mollman-----	Loamy-skeletal, mixed, frigid Typic Eutrochrepts
Niarada-----	Loamy-skeletal, mixed, frigid Calcic Haploxerolls
Ninepipe-----	Fine-silty, mixed, frigid Pachic Haploxerolls
Phillcher-----	Loamy-skeletal, mixed Andic Cryochrepts
Polson-----	Fine-silty, mixed, frigid Typic Natrixerolls
Post-----	Very-fine, illitic, frigid Typic Natrixerolls
Repp-----	Loamy-skeletal, mixed, frigid Typic Ustochrepts
Ronan-----	Very-fine, illitic, frigid Typic Natrixeralfs
Round Butte-----	Fine, mixed, frigid Typic Natrixeralfs
Rumblecreek-----	Loamy-skeletal, mixed Glossic Eutroboralfs
Sacheen-----	Mixed, frigid Typic Xeropsamments
Selon-----	Coarse-loamy, mixed, frigid Typic Xerochrepts
Selow-----	Fine-silty, illitic, frigid Typic Natrixeralfs
Sharrott-----	Loamy-skeletal, mixed, frigid Lithic Ustochrepts
Tevis-----	Loamy-skeletal, mixed, frigid Dystric Eutrochrepts
Trapps-----	Loamy-skeletal, mixed Typic Eutroboralfs
Truscreek-----	Fine-silty, mixed, frigid Calcic Haploxerolls
Typic Haplaquepts-----	Typic Haplaquepts
Vincom-----	Fine-silty, mixed (calcareous), frigid Typic Xerorthents
Waldbillig-----	Loamy-skeletal, mixed Andic Cryochrepts
Walstead-----	Loamy-skeletal, mixed Udic Haploborolls
Whitearth-----	Fine-silty, mixed, frigid Typic Natrixeralfs
Wildgen-----	Loamy-skeletal, mixed, frigid Typic Ustochrepts
Winfall-----	Loamy-skeletal, mixed, frigid Dystric Eutrochrepts
Winkler-----	Loamy-skeletal, mixed, frigid Typic Ustochrepts
Xerofluvents-----	Xerofluvents
Yellowbay-----	Sandy-skeletal, mixed, frigid Typic Xerochrepts

\* An asterisk in the first column indicates the series is a taxadjunct. This applies to map unit 71 only, and does not affect use and management.

ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Lake	Flathead	Total	
		County	County	Area	Extent
		Acres	Acres	Acres	Pct
1	Aeric Haplaquepts, 1 to 3 percent slopes-----	2,120	0	2,120	0.3
2	Badland-----	509	0	509	0.1
3	Bata gravelly silt loam, 8 to 30 percent slopes-----	117	0	117	*
4	Bata gravelly silt loam, 30 to 60 percent slopes-----	748	0	748	0.1
5	Belton silt loam, 0 to 2 percent slopes-----	1,962	0	1,962	0.3
6	Belton silt loam, 8 to 15 percent slopes-----	4,270	0	4,270	0.6
7	Belton silt loam, 15 to 35 percent slopes-----	415	0	415	0.1
8	Belton-Kerl silt loams, 2 to 4 percent slopes-----	6,024	0	6,024	0.8
9	Belton-Kerl silt loams, 4 to 8 percent slopes-----	5,227	0	5,227	0.7
10	Bigarm cobbly loam, 15 to 30 percent slopes-----	6,229	0	6,229	0.9
11	Bigarm cobbly loam, cool, 15 to 30 percent slopes-----	5,282	0	5,282	0.7
12	Bigarm gravelly loam, 8 to 15 percent slopes-----	2,587	0	2,587	0.4
13	Bigarm, cool-Hogsby-Rock outcrop complex, 30 to 60 percent slopes-----	18,481	0	18,481	2.5
14	Bigarm, cool-Rubble land complex, 30 to 60 percent slopes-----	1,690	0	1,690	0.2
15	Bigarm-Hogsby-Rock outcrop complex, 30 to 60 percent slopes-----	22,105	0	22,105	3.0
16	Bigarm-Rock outcrop-Rubble land complex, 30 to 60 percent slopes-----	4,287	0	4,287	0.6
17	Bohnly silt loam, 0 to 2 percent slopes-----	3,235	0	3,235	0.4
18	Bolack silt loam, 0 to 2 percent slopes-----	1,632	0	1,632	0.2
19	Borochemists, 0 to 1 percent slopes-----	2,784	15	2,799	0.4
20	Bowlake gravelly loam, 4 to 8 percent slopes-----	3,695	0	3,695	0.5
21	Bowlake-Minesinger gravelly loams, 8 to 15 percent slopes-----	6,459	0	6,459	0.9
22	Colake silt loam, 0 to 1 percent slopes-----	1,521	0	1,521	0.2
23	Colake silt loam, drained, 0 to 1 percent slopes-----	1,709	0	1,709	0.2
24	Colake-Sacheen complex, 0 to 3 percent slopes-----	259	0	259	*
25	Connah cobbly silt loam, 4 to 8 percent slopes-----	1,688	0	1,688	0.2
26	Connah silt loam, 0 to 2 percent slopes-----	1,088	0	1,088	0.1
27	Connah-Water complex, 2 to 4 percent slopes-----	4,224	0	4,224	0.6
28	Courville gravelly silt loam, 4 to 15 percent slopes-----	1,831	200	2,031	0.3
29	Courville gravelly silt loam, 15 to 30 percent slopes-----	8,344	57	8,401	1.1
30	Courville gravelly silt loam, 30 to 60 percent slopes-----	4,996	361	5,357	0.7
31	Courville gravelly silt loam, warm, 4 to 15 percent slopes-----	404	0	404	0.1
32	Courville gravelly silt loam, warm, 15 to 30 percent slopes-----	3,559	0	3,559	0.5
33	Courville gravelly silt loam, warm, 30 to 60 percent slopes-----	2,574	0	2,574	0.4
34	Courville-Rumblecreek complex, 8 to 30 percent slopes-----	739	0	739	0.1
35	Craddock channery silt loam, 30 to 60 percent slopes-----	323	0	323	*
36	Craddock silt loam, 4 to 15 percent slopes-----	1,932	0	1,932	0.3
37	Craddock silt loam, 15 to 30 percent slopes-----	5,490	0	5,490	0.8
38	Doker silt loam, 0 to 2 percent slopes-----	630	0	630	0.1
39	Dryfork silt loam, 0 to 4 percent slopes-----	1,009	0	1,009	0.1
40	Dryfork-Selow complex, 0 to 4 percent slopes-----	393	0	393	0.1
41	Dryfork-Selow complex, 4 to 15 percent slopes-----	141	0	141	*
42	Dubay silt loam, 0 to 2 percent slopes-----	479	0	479	0.1
43	Dubay silt loam, 2 to 6 percent slopes-----	859	0	859	0.1
44	Eaglewing gravelly silt loam, 8 to 15 percent slopes-----	999	27	1,026	0.1
45	Eaglewing gravelly silt loam, 15 to 30 percent slopes-----	1,651	0	1,651	0.2
46	Eaglewing silt loam, 2 to 8 percent slopes-----	2,886	66	2,952	0.4
47	Esteslake-Slickspots complex, 0 to 4 percent slopes-----	3,041	0	3,041	0.4
48	Felan gravelly silt loam, 15 to 30 percent slopes-----	296	0	296	*
49	Felan gravelly silt loam, 30 to 60 percent slopes-----	7,624	0	7,624	1.0
50	Finleypoint cobbly loam, 2 to 8 percent slopes-----	3,362	0	3,362	0.5
51	Finleypoint cobbly loam, 8 to 15 percent slopes-----	3,356	0	3,356	0.5
52	Finleypoint gravelly loam, 15 to 30 percent slopes-----	5,663	0	5,663	0.8
53	Finleypoint gravelly loam, 30 to 60 percent slopes-----	8,893	0	8,893	1.2
54	Finleypoint gravelly loam, dry, 15 to 30 percent slopes-----	1,024	0	1,024	0.1
55	Finleypoint very gravelly loam, dry, 30 to 60 percent slopes-----	8,339	0	8,339	1.1
56	Finleypoint-Wildgen gravelly loams, 30 to 60 percent slopes-----	1,721	0	1,721	0.2
57	Flott gravelly loam, 2 to 8 percent slopes-----	2,064	0	2,064	0.3
58	Flott gravelly loam, 8 to 15 percent slopes-----	1,386	0	1,386	0.2
59	Flott gravelly loam, 15 to 30 percent slopes-----	2,920	0	2,920	0.4
60	Flott gravelly loam, 30 to 60 percent slopes-----	4,111	0	4,111	0.6
61	Flott very gravelly loam, dry, 30 to 60 percent slopes-----	2,148	0	2,148	0.3
62	Gardencreek silty clay loam, 0 to 2 percent slopes-----	430	0	430	0.1
63	Gird silt loam, 0 to 2 percent slopes-----	1,926	0	1,926	0.3

\* See footnote at end of table.

ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--Continued

Map symbol	Soil name	Lake County	Flathead County	Total	
		Acres	Acres	Area	Extent
				Acres	Pct
64	Gird silt loam, 2 to 4 percent slopes-----	2,732	0	2,732	0.4
65	Gird-Dryfork silt loams, moderately wet, 0 to 1 percent slopes-----	963	0	963	0.1
66	Gird-Vincom silt loams, 4 to 8 percent slopes-----	2,401	0	2,401	0.3
67	Gird-Vincom silt loams, 8 to 15 percent slopes-----	2,568	0	2,568	0.4
68	Glaciercreek gravelly silt loam, 2 to 4 percent slopes-----	2,659	0	2,659	0.4
69	Half Moon silt loam, 2 to 4 percent slopes-----	1,535	87	1,622	0.2
70	Half Moon-Courville complex, 4 to 15 percent slopes-----	543	26	569	0.1
71	Hogsby-Finleypoint gravelly loams, 30 to 60 percent slopes-----	2,553	0	2,553	0.3
72	Hogsby-Rock outcrop complex, 15 to 45 percent slopes-----	9,969	0	9,969	1.4
73	Holloway gravelly silt loam, 15 to 30 percent slopes-----	1,463	0	1,463	0.2
74	Holloway gravelly silt loam, 30 to 60 percent slopes-----	10,097	0	10,097	1.4
75	Holloway gravelly silt loam, cool, 15 to 30 percent slopes-----	973	0	973	0.1
76	Holloway gravelly silt loam, cool, 30 to 60 percent slopes-----	2,580	0	2,580	0.4
77	Holloway, dry-Rock outcrop complex, 15 to 30 percent slopes-----	883	0	883	0.1
78	Holloway-Rubble land complex, 45 to 75 percent slopes-----	1,018	0	1,018	0.1
79	Irvine silty clay, 8 to 15 percent slopes-----	7,378	0	7,378	1.0
80	Irvine silty clay, 15 to 60 percent slopes-----	7,803	0	7,803	1.1
81	Jocko gravelly loam, 0 to 4 percent slopes-----	13,268	0	13,268	1.8
82	Jocko gravelly loam, 4 to 15 percent slopes-----	1,529	0	1,529	0.2
83	Jocko very stony sandy loam, 0 to 8 percent slopes-----	1,139	0	1,139	0.2
84	Kerl loam, 2 to 4 percent slopes-----	2,609	0	2,609	0.4
85	Kerl loam, 4 to 8 percent slopes-----	3,308	0	3,308	0.5
86	Kerrdam silt loam, 0 to 2 percent slopes-----	987	0	987	0.1
87	Kerrdam silt loam, 2 to 6 percent slopes-----	547	0	547	0.1
88	Kerrdam-Vincom silt loams, 6 to 15 percent slopes-----	825	0	825	0.1
89	Kerrdam-Vincom silt loams, 15 to 30 percent slopes-----	1,705	0	1,705	0.2
90	Kingspoint gravelly loam, 4 to 15 percent slopes-----	3,877	0	3,877	0.5
91	Kingspoint very gravelly loam, 15 to 30 percent slopes-----	3,322	0	3,322	0.5
92	Kingspoint very gravelly loam, 30 to 60 percent slopes-----	4,533	0	4,533	0.6
93	Lamoose loam, 0 to 2 percent slopes-----	2,994	0	2,994	0.4
94	Lonepine silt loam, 0 to 2 percent slopes-----	924	0	924	0.1
95	Lonepine silt loam, 2 to 4 percent slopes-----	3,360	0	3,360	0.5
96	Lonepine silt loam, dry, 2 to 8 percent slopes-----	33	0	33	*
97	Lonepine-Vincom silt loams, 4 to 8 percent slopes-----	2,161	0	2,161	0.3
98	Lonepine-Vincom silt loams, dry, 4 to 15 percent slopes-----	51	0	51	*
99	Marklepass silty clay loam, 0 to 2 percent slopes-----	609	0	609	0.1
100	Marklepass-Slickspots complex, 0 to 2 percent slopes-----	518	0	518	0.1
101	McCillum fine sandy loam, 0 to 2 percent slopes-----	2,061	0	2,061	0.3
102	McCillum fine sandy loam, 2 to 4 percent slopes-----	4,698	0	4,698	0.6
103	McCillum fine sandy loam, 4 to 8 percent slopes-----	2,230	0	2,230	0.3
104	McCillum fine sandy loam, gravelly substratum, 0 to 2 percent slopes-----	1,732	0	1,732	0.2
105	McDonald cobbly silty clay loam, 2 to 4 percent slopes-----	6,925	0	6,925	0.9
106	McDonald cobbly silty clay loam, 4 to 8 percent slopes-----	4,111	0	4,111	0.6
107	McDonald cobbly silty clay loam, 8 to 15 percent slopes-----	1,923	0	1,923	0.3
108	McDonald silty clay loam, 0 to 2 percent slopes-----	563	0	563	0.1
109	Minesinger stony loam, 4 to 15 percent slopes-----	3,500	0	3,500	0.5
110	Minesinger-Walstead very stony loams, 15 to 45 percent slopes-----	4,682	0	4,682	0.6
111	Mitten gravelly silt loam, 8 to 30 percent slopes-----	1,627	0	1,627	0.2
112	Mitten very gravelly silt loam, 30 to 60 percent slopes-----	9,450	325	9,775	1.3
113	Mitten very gravelly silt loam, dry, 30 to 60 percent slopes-----	8,312	0	8,312	1.1
114	Mitten, dry-Rock outcrop complex, 30 to 60 percent slopes-----	1,812	0	1,812	0.2
115	Moiese loam, 0 to 2 percent slopes-----	3,784	0	3,784	0.5
116	Mollman gravelly loam, 0 to 4 percent slopes-----	352	0	352	*
117	Mollman gravelly loam, 4 to 15 percent slopes-----	1,340	88	1,428	0.2
118	Mollman gravelly loam, 15 to 30 percent slopes-----	1,625	28	1,653	0.2
119	Mollman very gravelly loam, 30 to 60 percent slopes-----	6,800	0	6,800	0.9
120	Niarada gravelly loam, 0 to 4 percent slopes-----	2,025	0	2,025	0.3
121	Niarada gravelly loam, 4 to 8 percent slopes-----	2,116	0	2,116	0.3
122	Niarada gravelly loam, 8 to 15 percent slopes-----	2,586	0	2,586	0.4
123	Niarada gravelly loam, cool, 15 to 30 percent slopes-----	12,366	0	12,366	1.7
124	Niarada gravelly loam, cool, 30 to 60 percent slopes-----	3,362	0	3,362	0.5
125	Niarada-Kerl complex, 8 to 15 percent slopes-----	6,248	0	6,248	0.9
126	Ninepipe silt loam, 0 to 2 percent slopes-----	2,551	0	2,551	0.3

\* See footnote at end of table.

ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--Continued

Map symbol	Soil name	Lake County	Flathead County	Total	
				Area	Extent
		Acres	Acres	Acres	Pct
127	Phillcher gravelly silt loam, 15 to 45 percent slopes-	476	0	476	0.1
128	Phillcher-Rock outcrop complex, 45 to 75 percent slopes-----	928	0	928	0.1
129	Pits, gravel-----	528	0	528	0.1
130	Polson silt loam, 0 to 2 percent slopes-----	4,311	0	4,311	0.6
131	Polson silt loam, 2 to 4 percent slopes-----	4,895	0	4,895	0.7
132	Polson-Vincom silt loams, 4 to 8 percent slopes-----	2,383	0	2,383	0.3
133	Post silt loam, 0 to 2 percent slopes-----	15,432	0	15,432	2.1
134	Post silty clay loam, 2 to 4 percent slopes-----	12,458	0	12,458	1.7
135	Post silty clay loam, 4 to 8 percent slopes-----	3,907	0	3,907	0.5
136	Post-Ronan-Water complex, 2 to 8 percent slopes-----	6,783	0	6,783	0.9
137	Post-Ronan-Water complex, 8 to 15 percent slopes-----	1,876	0	1,876	0.3
138	Repp gravelly loam, 30 to 60 percent slopes-----	2,439	0	2,439	0.3
139	Repp, cool-Rock outcrop complex, 30 to 60 percent slopes-----	8,042	0	8,042	1.1
140	Rock outcrop-Rubble land complex-----	1,575	63	1,638	0.2
141	Ronan silty clay loam, 0 to 2 percent slopes-----	2,435	0	2,435	0.3
142	Ronan silty clay loam, 2 to 4 percent slopes-----	7,118	0	7,118	1.0
143	Ronan silty clay loam, 4 to 8 percent slopes-----	3,252	0	3,252	0.4
144	Round Butte silty clay loam, 0 to 2 percent slopes-----	7,700	0	7,700	1.1
145	Round Butte silty clay loam, 2 to 4 percent slopes-----	12,332	0	12,332	1.7
146	Round Butte silty clay loam, 4 to 8 percent slopes-----	7,776	0	7,776	1.1
147	Round Butte silty clay loam, dry, 0 to 2 percent slopes-----	78	0	78	*
148	Round Butte-Irvine silty clay loams, 2 to 8 percent slopes-----	824	0	824	0.1
149	Round Butte-Irvine silty clay loams, dry, 4 to 15 percent slopes-----	539	0	539	0.1
150	Rumblcreek gravelly loam, 2 to 8 percent slopes-----	673	0	673	0.1
151	Rumblcreek gravelly loam, 8 to 15 percent slopes-----	2,125	0	2,125	0.3
152	Rumblcreek gravelly loam, 15 to 30 percent slopes-----	4,146	6	4,152	0.6
153	Rumblcreek gravelly loam, 30 to 60 percent slopes-----	3,334	139	3,473	0.5
154	Sacheen fine sand, hummocky, 3 to 10 percent slopes---	521	0	521	0.1
155	Sacheen loamy fine sand, 0 to 8 percent slopes-----	6,671	0	6,671	0.9
156	Selon fine sandy loam, 0 to 2 percent slopes-----	902	0	902	0.1
157	Selon fine sandy loam, 2 to 4 percent slopes-----	1,127	0	1,127	0.2
158	Selon fine sandy loam, 4 to 8 percent slopes-----	477	0	477	0.1
159	Selon sandy loam, 8 to 15 percent slopes-----	1,194	0	1,194	0.2
160	Selow silty clay loam, 0 to 2 percent slopes-----	591	0	591	0.1
161	Selow silty clay loam, 2 to 4 percent slopes-----	787	0	787	0.1
162	Tevis very gravelly loam, 30 to 60 percent slopes-----	4,233	121	4,354	0.6
163	Trapps gravelly loam, 8 to 15 percent slopes-----	290	0	290	*
164	Trapps gravelly loam, 15 to 30 percent slopes-----	1,838	0	1,838	0.3
165	Truscreek silt loam, 0 to 2 percent slopes-----	1,786	0	1,786	0.2
166	Truscreek-Polson silt loams, 0 to 2 percent slopes---	3,009	0	3,009	0.4
167	Truscreek-Polson silt loams, 2 to 4 percent slopes-----	3,533	0	3,533	0.5
168	Truscreek-Polson silt loams, 4 to 8 percent slopes-----	2,570	0	2,570	0.4
169	Typic Haplaquepts, 0 to 2 percent slopes-----	787	0	787	0.1
170	Vincom silt loam, 15 to 60 percent slopes-----	5,472	0	5,472	0.7
171	Vincom-Lonepine silt loams, 8 to 15 percent slopes---	3,608	0	3,608	0.5
172	Waldbillig gravelly silt loam, 15 to 30 percent slopes	925	0	925	0.1
173	Waldbillig gravelly silt loam, 30 to 60 percent slopes	549	0	549	0.1
174	Walstead gravelly loam, 0 to 2 percent slopes-----	1,578	0	1,578	0.2
175	Walstead gravelly loam, 2 to 4 percent slopes-----	2,295	0	2,295	0.3
176	Walstead gravelly loam, 4 to 15 percent slopes-----	3,792	0	3,792	0.5
177	Walstead-Rock outcrop complex, 15 to 30 percent slopes	1,849	0	1,849	0.3
178	Whitearth-Esteslake complex, 2 to 8 percent slopes---	397	0	397	0.1
179	Wildgen gravelly loam, 8 to 30 percent slopes-----	6,114	427	6,541	0.9
180	Wildgen very gravelly loam, 30 to 60 percent slopes---	8,197	24	8,221	1.1
181	Wildgen-Finleyppoint gravelly loams, 15 to 30 percent slopes-----	2,923	0	2,923	0.4
182	Winfall very gravelly loam, 4 to 15 percent slopes---	1,353	121	1,474	0.2
183	Winfall very gravelly loam, 15 to 30 percent slopes---	3,397	72	3,469	0.5
184	Winfall very gravelly loam, 30 to 60 percent slopes---	1,757	0	1,757	0.2
185	Winkler, cool-Rock outcrop complex, 30 to 60 percent slopes-----	1,573	351	1,924	0.3
186	Winkler very gravelly loam, cool, 30 to 60 percent slopes-----	14,659	679	15,338	2.1
187	Winkler-Sharrott-Rock outcrop complex, 30 to 60 percent slopes-----	2,850	0	2,850	0.4
188	Xerofluvents, 0 to 2 percent slopes-----	3,946	29	3,975	0.5

\* See footnote at end of table.

ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--Continued

Map symbol	Soil name	Lake County	Flathead County	Total	
				Area	Extent
		<u>Acres</u>	<u>Acres</u>	<u>Acres</u>	<u>Pct</u>
189	Xerofluvents, dry, 0 to 2 percent slopes-----	188	0	188	*
190	Yellowbay very gravelly loam, 0 to 4 percent slopes---	1,268	15	1,283	0.2
191	Yellowbay very gravelly loam, 4 to 15 percent slopes--	408	23	431	0.1
192	Yellowbay very gravelly loam, 15 to 30 percent slopes-	883	0	883	0.1
M-W	Miscellaneous water-----	30	0	30	*
W	Water-----	96,350	20	96,370	13.2
	Total-----	728,130	3,370	731,500	100.0

\* Less than 0.05 percent.

# Soil Series and Detailed Map Units

---

In this section, arranged in alphabetical order, each soil series recognized in the survey area is described. Each description is followed by the detailed soil map units associated with the series.

Characteristics of the soil and the material in which it formed are identified for each soil 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" (17). Many of the technical terms used in the descriptions are defined in "Soil Taxonomy" (19). 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 on the detailed soil maps in Part III of this survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions in this section, along with the maps, can be used to determine the suitability and potential of a unit for specific uses. They also can be used to plan the management needed for those uses. More information about each map unit is given in Part II of this survey.

A map unit delineation on the detailed soil maps represents an area on the landscape and consists of one or more soils or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils or miscellaneous areas. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils and miscellaneous areas are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, are mapped without areas of minor components of other taxonomic classes. Consequently, map units are made up of the soils or miscellaneous areas for

which they are named and some areas of minor components that belong to other taxonomic classes.

Minor components have properties and behavioral characteristics divergent enough to affect use or to require different management. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into segments that have similar use and management requirements. The delineation of such landscape segments on the map provides sufficient information for the development of resource plans, but if intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit 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 layers, 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 layers. 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, Post silt loam, 0 to 2 percent slopes is a phase of the Post series.

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

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

This survey includes *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Badland is an example.

The table "Acreage and Proportionate Extent of the Soils" in Parts I and II of the manuscript 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 or miscellaneous areas.

## Aeric Haplaquepts

Aeric Haplaquepts consist of very deep, poorly drained soils on flood plains in mountains. These soils formed in alluvium. Slope is 1 to 3 percent. Elevation is 3,100 to 3,400 feet. The average annual precipitation is about 18 to 25 inches, average annual air temperature is 39 to 45 degrees F, and the frost-free period is 60 to 90 days.

### Typical Pedon

Aeric Haplaquepts, in an area of woodland; 2,000 feet south and 250 feet east of the northwest corner of sec. 8, T. 25 N., R. 20 W.

Oe--2 inches to 0; partially decomposed forest litter.

A--0 to 12 inches; grayish brown (10YR 5/2) moist, silt loam, light gray (10YR 7/2); moderate medium and fine subangular blocky

structure; soft, very friable, slightly sticky and slightly plastic; slightly effervescent; neutral; abrupt wavy boundary.

Bw--12 to 23 inches; light brownish gray (10YR 6/2) moist, silt loam, white (10YR 8/2); weak coarse and medium subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; moderately alkaline; strongly effervescent; abrupt smooth boundary.

Cg1--23 to 36 inches; light gray (2.5Y 7/2) moist, silt loam, white (2.5Y 8/2); massive; soft, very friable, slightly sticky and slightly plastic; many large very pale brown and light gray (10YR 8/3 and 10YR 7/1) mottles; violently effervescent; moderately alkaline; abrupt smooth boundary.

Cg2--36 to 60 inches; light gray (2.5YR 7/2) moist, loam, white (N 8/0); massive; soft, very friable, slightly sticky and slightly plastic; 5 percent pebbles; many large very pale brown and light gray (10YR 7/4 and 10YR 7/2) mottles; violently effervescent; moderately alkaline.

### Range in Characteristics

*Depth to seasonal water table:* 6 to 18 inches

*Content of rock fragments in the control section:* 0 to 50 percent

*Texture:* Sandy loam to clay

*Reaction:* pH 6.6 to 8.4

## 1--Aeric Haplaquepts, 1 to 3 percent slopes

### Setting

*Landform:* Flood plains

*Slope:* 1 to 3 percent

*Elevation:* 3,100 to 3,400 feet

*Mean annual precipitation:* 18 to 25 inches

*Frost-free period:* 60 to 90 days

### Composition

#### Major Components

Aeric Haplaquepts and similar soils: 85 percent

#### Minor Components

Borohemists: 0 to 2 percent

Eaglewing and similar soils: 0 to 7 percent

Mollman and similar soils: 0 to 6 percent

### Major Component Description

*Depth class:* Very deep (more than 60 inches)

*Drainage class:* Poorly drained

*Dominant parent material:* Alluvium  
*Native plant cover type:* Forest land  
*Flooding:* Frequent  
*Water table:* Apparent

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

## Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Forest Land" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## 2--Badland

### Setting

*Landform:* Escarpments  
*Slope:* 20 to 60 percent  
*Elevation:* 2,600 to 3,100 feet  
*Mean annual precipitation:* 10 to 12 inches  
*Frost-free period:* 105 to 120 days

### Composition

#### Major Components

Badland: 90 percent

#### Minor Components

Areas supporting vegetation: 0 to 10 percent

### Major Component Description

*Definition:* Steep or very steep, commonly nonstony, barren land dissected by many intermittent drainage channels. Geologic erosion is active.

*Dominant parent material:* Lacustrine deposits

## Bata Series

Bata series consists of very deep, well drained soils on mountain slopes. These soils formed in alpine till. They have a surface layer of volcanic ash-influenced loess. Slope is 8 to 60 percent. Elevation is 4,200 to 5,200 feet. The average annual precipitation is 30 to 40 inches, average annual air temperature is 38 to 42 degrees F, and the frost-free period is 40 to 60 days.

**Taxonomic Class:** Loamy-skeletal, mixed Andic Cryoboralfs

## Typical Pedon

Bata gravelly silt loam, 30 to 60 percent slopes, in an area of woodland; approximately 1,900 feet south and 300 feet west of the northeast corner of sec. 11, T. 25 N., R. 21 W.

Oi--1 inch to 0; fresh needles and twigs; abrupt smooth boundary.

E--0 to 2 inches; white (10YR 8/2) gravelly silt loam, pale brown (10YR 6/3) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine and fine roots and common medium and coarse roots; 20 percent pebbles; medium acid; clear smooth boundary.

Bs--2 to 9 inches; light yellowish brown (10YR 6/4) gravelly silt loam, dark yellowish brown (10YR 4/4) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine and fine roots and common medium and coarse roots; 20 percent pebbles; medium acid; abrupt smooth boundary.

2E--9 to 21 inches; light gray (10YR 7/2) very gravelly loam, grayish brown (10YR 5/2) moist; weak fine subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; common very fine, fine, and medium roots; 50 percent pebbles; medium acid; clear wavy boundary.

2Bt/E--21 to 25 inches; 70 percent is pale brown (10YR 6/3) very gravelly clay loam, brown (10YR 5/3) moist (B part); 30 percent is light gray (10YR 7/2) very gravelly clay loam, grayish brown (10YR 5/2) moist (E part); moderate medium subangular blocky structure; slightly hard, friable, sticky and plastic; common very fine, fine, and medium roots; 40 percent pebbles; medium acid; clear wavy boundary.

2Bt1--25 to 40 inches; pale brown (10YR 6/3) very gravelly clay loam, brown (10YR 5/3) moist; moderate medium subangular blocky structure; slightly hard, friable, sticky and plastic; common very fine, fine, and medium roots; few distinct clay films on faces of peds; 40 percent pebbles; medium acid; clear wavy boundary.

2Bt2--40 to 60 inches; pale brown (10YR 6/3) very gravelly clay loam, brown (10YR 5/3) moist; moderate medium subangular blocky structure; slightly hard, friable, sticky and plastic; common very fine, fine, and medium roots; common distinct clay films on faces of peds; 45 percent pebbles, 5 percent cobbles; medium acid.

### Range in Characteristics

*Soil temperature:* 39 to 44 degrees F (mean temperature in June and July; August is less than 59 degrees F)

*Moisture control section:* Between 4 and 12 inches

*Content of clay in the control section:* 20 to 35 percent

#### *E horizon*

Content of rock fragments: 15 to 35 percent--0 to 5 percent cobbles, 15 to 30 percent pebbles

Reaction: pH 5.1 to 6.5

#### *Bs horizon*

Hue: 10YR or 7.5YR

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 4 or 6

Texture: Silt loam or loam

Clay content: 12 to 25 percent

Content of rock fragments: 15 to 35 percent--0 to 5 percent cobbles, 15 to 30 percent pebbles

Moist bulk density: 1.0 g/cc or less

Reaction: pH 5.6 to 6.5

#### *2E horizon*

Content of rock fragments: 35 to 60 percent--0 to 10 percent cobbles and stones, 35 to 50 percent pebbles

Reaction: pH 5.6 to 6.5

#### *2Bt/E horizon*

Hue: B part--10YR, 7.5YR, or 5YR; E part--10YR, 7.5YR, or 5YR

Value: B part--5 or 6 dry and 4 or 5 moist; E part--6, 7, or 8, dry and 5 or 6 moist

Chroma: B part--3 or 4; E part--2 or 3

Clay content, mixed: 12 to 25 percent

Content of rock fragments: 35 to 60 percent--0 to 10 percent cobbles and stones, 25 to 50 percent pebbles

Reaction: pH 5.6 to 6.5

#### *2Bt horizons*

Hue: 10YR, 7.5YR, or 5YR

Value: 5, 6, or 7 dry; 4 or 5 moist

Chroma: 3 or 4

Texture: Sandy clay loam or clay loam

Clay content: 20 to 35 percent

Content of rock fragments: 35 to 60 percent--0 to 10 percent cobbles and stones, 35 to 50 percent pebbles

Reaction: pH 5.6 to 6.5

### 3--Bata gravelly silt loam, 8 to 30 percent slopes

#### Setting

*Landform:* Mountains

*Slope:* 8 to 30 percent

*Elevation:* 4,200 to 5,200 feet

*Mean annual precipitation:* 30 to 40 inches

*Frost-free period:* 40 to 60 days

#### Composition

##### Major Components

Bata and similar soils: 90 percent

##### Minor Components

Holloway and similar soils: 0 to 10 percent

#### Major Component Description

*Surface layer texture:* Gravelly silt loam

*Depth class:* Very deep (more than 60 inches)

*Drainage class:* Well drained

*Dominant parent material:* Alpine till

*Native plant cover type:* Forest land

*Flooding:* None

*Available water capacity:* Mainly 5.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

#### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Forest Land" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

- \* "Engineering" and "Soil Properties" sections

#### 4--Bata gravelly silt loam, 30 to 60 percent slopes

##### Setting

*Landform:* Mountains  
*Slope:* 30 to 60 percent  
*Elevation:* 4,200 to 5,200 feet  
*Mean annual precipitation:* 30 to 40 inches  
*Frost-free period:* 40 to 60 days

##### Composition

###### Major Components

Bata and similar soils: 85 percent

###### Minor Components

Waldbillig and similar soils: 0 to 5 percent  
 Holloway and similar soils: 0 to 5 percent  
 Soils shallow to bedrock: 0 to 5 percent

##### Major Component Description

*Surface layer texture:* Gravelly silt loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Alpine till  
*Native plant cover type:* Forest land  
*Flooding:* None  
*Available water capacity:* Mainly 5.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

##### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Forest Land" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section

#### Belton Series

Belton series consists of very deep, well drained soils on moraines and dissected till plains. These soils formed in material derived from glaciolacustrine deposits. Slope is 0 to 35 percent. Elevation is 2,800 to 3,400 feet. The average annual precipitation is 14 to 18 inches, average annual air temperature is 42 to 45 degrees F, and the frost-free period is 105 to 135 days.

**Taxonomic Class:** Fine, illitic, frigid Typic Natrixerolls

##### Typical Pedon

Belton silt loam in an area of Belton-Kerl silt loams, 2 to 4 percent slopes, in cropland; 1,600 feet east and 50 feet north of the southwest corner of sec. 24, T. 22 N., R. 21 W.

- Ap--0 to 8 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; moderate medium subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; many fine and medium roots; common very fine tubular pores; neutral; abrupt smooth boundary.
- Bt/E--8 to 10 inches; 70 percent is pale brown (10YR 6/3) silty clay loam, brown (10YR 5/3) moist (B part); 30 percent is very pale brown (10YR 7/3) silt loam, dark grayish brown (10YR 5/2) moist (E part); moderate coarse subangular blocky structure parting to moderate fine subangular blocky; slightly hard, friable, sticky and plastic; common medium roots and many fine roots; common medium pores and many fine tubular pores; common distinct clay films on faces of peds; mildly alkaline; abrupt smooth boundary.
- Btn--10 to 19 inches; very pale brown (10YR 7/3) silty clay, brown (10YR 5/3) moist; strong medium prismatic structure parting to moderate medium angular blocky; hard, firm, very sticky and very plastic; few medium roots, common fine roots, and many very fine roots; common very fine tubular pores and few fine tubular pores; common distinct continuous dark brown (10YR 4/3) clay films on faces of peds and in pores; common distinct continuous very dark gray (10YR 3/1) organic films on faces of peds; strongly alkaline; clear smooth boundary.

Bkn--19 to 29 inches; light gray (10YR 7/2) silty clay loam, pale brown (10YR 6/3) moist; weak coarse prismatic structure parting to moderate fine and medium platy; hard, firm, sticky and plastic; few fine roots and common very fine roots; common very fine tubular pores; disseminated lime and few faint masses of lime; violently effervescent; strongly alkaline; clear wavy boundary.

C1--29 to 39 inches; white (10YR 8/2) silty clay loam, brown (10YR 5/3) moist; massive; fine stratifications; common 1/4- to 2-inch thick varves; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; few very fine tubular pores; disseminated lime; strongly effervescent; moderately alkaline; clear smooth boundary.

C2--39 to 60 inches; white (10YR 8/2) silt loam, pale brown (10YR 6/3) moist; massive; fine stratifications; few 1/4- to 2-inch thick varves; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; few very fine tubular pores; disseminated lime; strongly effervescent; moderately alkaline.

### Range in Characteristics

*Soil temperature:* 44 to 47 degrees F  
*Moisture control section:* Between 4 and 12 inches, dry summers from late June through early August  
*Mollic epipedon thickness:* 7 to 12 inches  
*Content of clay in the control section:* 35 to 60 percent  
*Depth to Bkn horizon:* 13 to 25 inches

*Ap horizon*  
 Value: 4 or 5 dry; 2 or 3 moist  
 Chroma: 2 or 3  
 Clay content: 18 to 27 percent  
 Content of rock fragments: 0 to 15 percent--0 to 5 percent cobbles, 0 to 10 percent pebbles  
 Reaction: pH 6.6 to 7.3

*Bt/E horizon*  
 Hue: 10YR or 2.5Y  
 Value: B part--5, 6 dry and 4 or 5 moist; E part--7 or 8 dry and 5 or 6 moist  
 Chroma: B part--2 or 3; E part--2 or 3  
 Texture: B part--silty clay loam or silty clay; E part--silt loam or loam; mixed, silty clay loam  
 Clay content: B part--35 to 45 percent; E part--18 to 27 percent; mixed--27 to 40 percent

Content of rock fragments: 0 to 15 percent--0 to 5 percent cobbles, 0 to 10 percent pebbles  
 Sodium adsorption ratio: 5 to 10  
 Reaction: pH 6.6 to 7.8

*Btn horizon*  
 Value: 6 or 7 dry; 4 or 5 moist  
 Texture: Silty clay, clay, or silty clay loam  
 Clay content: 35 to 60 percent  
 Content of rock fragments: 0 to 15 percent--0 to 5 percent cobbles, 0 to 10 percent pebbles  
 Electrical conductivity: 2 to 4 mmhos/cm  
 Sodium adsorption ratio: 13 to 40  
 Reaction: pH 8.5 to 9.0

*Bkn horizon*  
 Hue: 10YR or 2.5Y  
 Value: 6 or 7 dry; 5 or 6 moist  
 Chroma: 2 or 3  
 Texture: Silty clay or silty clay loam  
 Clay content: 30 to 55 percent  
 Content of rock fragments: 0 to 15 percent--0 to 5 percent cobbles, 0 to 10 percent pebbles  
 Calcium carbonate equivalent: 10 to 15 percent  
 Electrical conductivity: 2 to 4 mmhos/cm  
 Sodium adsorption ratio: 13 to 30 percent  
 Reaction: pH 8.5 to 9.0

*C1, C2 horizons*  
 Hue: 10YR or 2.5Y  
 Value: 7 or 8 dry; 5 or 6 moist  
 Chroma: 2 or 3  
 Texture: Silty clay loam or silt loam  
 Clay content: 20 to 40 percent  
 Content of rock fragments: 0 to 15 percent--0 to 5 percent cobbles, 0 to 10 percent pebbles  
 Calcium carbonate equivalent: 5 to 10 percent  
 Electrical conductivity: 2 to 4 mmhos/cm  
 Sodium adsorption ratio: 10 to 30 percent  
 Reaction: pH 7.9 to 9.0

## 5--Belton silt loam, 0 to 2 percent slopes

### Setting

*Landform:* Till plains  
*Slope:* 0 to 2 percent  
*Elevation:* 2,800 to 3,400 feet  
*Mean annual precipitation:* 14 to 18 inches

*Frost-free period:* 105 to 135 days

### Composition

#### Major Components

Belton and similar soils: 85 percent

#### Minor Components

Gird and similar soils: 0 to 7 percent

Polson and similar soils: 0 to 7 percent

Poorly drained soils: 0 to 1 percent

### Major Component Description

*Surface layer texture:* Silt loam

*Depth class:* Very deep (more than 60 inches)

*Drainage class:* Well drained

*Dominant parent material:* Glaciolacustrine deposits

*Flooding:* None

*Sodium affected:* Sodic within 30 inches

*Available water capacity:* Mainly 8.4 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## 6--Belton silt loam, 8 to 15 percent slopes

### Setting

*Landform:* Moraines

*Slope:* 8 to 15 percent

*Elevation:* 2,800 to 3,400 feet

*Mean annual precipitation:* 14 to 18 inches

*Frost-free period:* 105 to 120 days

### Composition

#### Major Components

Belton and similar soils: 85 percent

#### Minor Components

Kerl and similar soils: 0 to 5 percent

Round Butte and similar soils: 0 to 5 percent

Post and similar soils: 0 to 5 percent

### Major Component Description

*Surface layer texture:* Silt loam

*Depth class:* Very deep (more than 60 inches)

*Drainage class:* Well drained

*Dominant parent material:* Glaciolacustrine deposits

*Native plant cover type:* Rangeland

*Flooding:* None

*Sodium affected:* Sodic within 30 inches

*Available water capacity:* Mainly 8.4 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## 7--Belton silt loam, 15 to 35 percent slopes

### Setting

*Landform:* Moraines

*Slope:* 15 to 35 percent

*Elevation:* 2,800 to 3,400 feet

*Mean annual precipitation:* 14 to 18 inches

*Frost-free period:* 105 to 135 days

### Composition

#### Major Components

Belton and similar soils: 85 percent

#### Minor Components

Kerl and similar soils: 0 to 5 percent

Round Butte and similar soils: 0 to 5 percent

Post and similar soils: 0 to 5 percent

## Major Component Description

*Surface layer texture:* Silt loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Glaciolacustrine deposits  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Sodium affected:* Sodic within 30 inches  
*Available water capacity:* Mainly 8.4 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

## Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## 8--Belton-Kerl silt loams, 2 to 4 percent slopes

### Setting

#### *Landform:*

- \* Belton--Till plains
- \* Kerl--Till plains

#### *Slope:*

- \* Belton--2 to 4 percent
- \* Kerl--2 to 4 percent

*Elevation:* 2,800 to 3,400 feet

*Mean annual precipitation:* 14 to 18 inches

*Frost-free period:* 105 to 130 days

### Composition

#### Major Components

Belton and similar soils: 50 percent

Kerl and similar soils: 35 percent

#### Minor Components

Ninepipe and similar soils: 0 to 5 percent

Polson and similar soils: 0 to 5 percent

Round Butte, moist soils: 0 to 5 percent

## Major Component Description

### Belton

*Surface layer texture:* Silt loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Glaciolacustrine deposits  
*Flooding:* None  
*Sodium affected:* Sodic within 30 inches  
*Available water capacity:* Mainly 8.4 inches

### Kerl

*Surface layer texture:* Silt loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Glaciolacustrine deposits  
*Flooding:* None  
*Available water capacity:* Mainly 10.7 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

## Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## 9--Belton-Kerl silt loams, 4 to 8 percent slopes

### Setting

#### *Landform:*

- \* Belton--Till plains
- \* Kerl--Till plains

#### *Slope:*

- \* Belton--4 to 8 percent
- \* Kerl--4 to 8 percent

*Elevation:* 2,800 to 3,400 feet

*Mean annual precipitation:* 14 to 18 inches

*Frost-free period:* 105 to 130 days

## Composition

### Major Components

Belton and similar soils: 45 percent

Kerl and similar soils: 40 percent

### Minor Components

Ninepipe and similar soils: 0 to 5 percent

Polson and similar soils: 0 to 5 percent

Round Butte, moist soils: 0 to 3 percent

Niarada and similar soils: 0 to 2 percent

## Major Component Description

### Belton

*Surface layer texture:* Silt loam

*Depth class:* Very deep (more than 60 inches)

*Drainage class:* Well drained

*Dominant parent material:* Glaciolacustrine deposits

*Flooding:* None

*Sodium affected:* Sodic within 30 inches

*Available water capacity:* Mainly 8.3 inches

### Kerl

*Surface layer texture:* Silt loam

*Depth class:* Very deep (more than 60 inches)

*Drainage class:* Well drained

*Dominant parent material:* Glaciolacustrine deposits

*Flooding:* None

*Available water capacity:* Mainly 10.7 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

## Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## Bigarm Series

Bigarm series consists of very deep, somewhat excessively drained soils on mountains and hills. These soils formed in colluvium derived from

argillite and quartzite. Slope is 8 to 60 percent. Elevation is 3,000 to 5,500 feet. The average annual precipitation is 15 to 19 inches, average annual air temperature is 41 to 45 degrees F, and the frost-free period is 105 to 120 days.

**Taxonomic Class:** Loamy-skeletal, mixed, frigid Typic Haploxerolls

## Typical Pedon

Bigarm very gravelly loam in an area of Bigarm-Hogsby-Rock outcrop complex, 30 to 60 percent slopes, in rangeland; 1,400 feet south and 250 feet east of the northwest corner of sec. 32, T. 18 N., R. 20 W.

A--0 to 12 inches; dark grayish brown (10YR 4/2) very gravelly loam, very dark grayish brown (10YR 3/2) moist; moderate fine and very fine granular structure; soft, very friable, nonsticky and nonplastic; many fine and very fine roots; many fine and very fine pores; 45 percent angular pebbles; neutral; gradual wavy boundary.

Bw--12 to 18 inches; brown (10YR 5/3) very gravelly loam, dark brown (10YR 4/3) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; common fine and very fine roots; common fine and very fine pores; 50 percent angular pebbles; neutral; gradual wavy boundary.

BC--18 to 38 inches; very pale brown (10YR 7/3) very gravelly fine sandy loam, brown (10YR 5/3) moist; massive; slightly hard, very friable, nonsticky and nonplastic; few fine and very fine roots in upper part; 50 percent angular pebbles; neutral; gradual wavy boundary.

C--38 to 60 inches; very pale brown (10YR 7/3) extremely gravelly sandy loam, brown (10YR 5/3) moist; massive; soft, very friable, nonsticky and nonplastic; 55 percent angular pebbles and 10 percent angular cobbles; neutral.

## Range in Characteristics

*Soil temperature:* 43 to 47 degrees F

*Moisture control section:* Between 8 and 24 inches

*Mollic epipedon thickness:* 8 to 16 inches

*Control section:* 35 to 70 percent rock fragments and 5 to 18 percent clay

*Other features:* Rock fragments are mainly argillite and quartzite; in some pedons calcareous material is below a depth of 40 inches

*A horizon*

Hue: 7.5YR or 10YR  
Value: 3, 4, or 5 dry; 2 or 3 moist  
Chroma: 1 or 2  
Clay content: 7 to 18 percent  
Content of rock fragments: 20 to 60 percent--0 to 20 percent angular cobbles and stones, 10 to 50 percent angular pebbles  
Reaction: pH 6.6 to 7.3

*Bw horizon*

Hue: 7.5YR or 10YR  
Value: 5 or 6 dry; 4 or 5 moist  
Chroma: 2, 3, or 4  
Texture: Loam, fine sandy loam, or sandy loam  
Clay content: 5 to 18 percent  
Content of rock fragments: 35 to 60 percent--0 to 10 percent angular cobbles and stones, 35 to 50 percent angular pebbles  
Reaction: pH 6.6 to 7.3

*BC horizon*

Value: 6 or 7 dry; 4 or 5 moist  
Chroma: 2 or 3  
Texture: Loam, fine sandy loam, or sandy loam  
Clay content: 5 to 18 percent  
Content of rock fragments: 35 to 60 percent--0 to 10 percent angular cobbles and stones, 35 to 50 percent angular pebbles  
Reaction: pH 6.6 to 7.3

*C horizon*

Value: 6 or 7 dry; 4 or 5 moist  
Chroma: 2 or 3  
Texture: Loam or sandy loam  
Clay content: 5 to 18 percent  
Content of rock fragments: 40 to 85 percent--5 to 40 percent angular cobbles and stones, 20 to 60 percent angular pebbles  
Reaction: pH 6.6 to 7.3

**10--Bigarm cobbly loam, 15 to 30 percent slopes**

**Setting**

*Landform:* Mountains  
*Slope:* 15 to 30 percent  
*Elevation:* 3,000 to 5,500 feet  
*Mean annual precipitation:* 15 to 19 inches  
*Frost-free period:* 105 to 120 days

**Composition**

**Major Components**

Bigarm and similar soils: 85 percent

**Minor Components**

Bigarm very stony loam soils: 0 to 5 percent  
Hogsby and similar soils: 0 to 5 percent  
Rock outcrop areas: 0 to 3 percent  
Rubble land areas: 0 to 2 percent

**Major Component Description**

*Surface layer texture:* Cobbly loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Somewhat excessively drained  
*Dominant parent material:* Colluvium  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 4.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

**Management**

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

**11--Bigarm cobbly loam, cool, 15 to 30 percent slopes**

**Setting**

*Landform:* Mountains  
*Slope:* 15 to 30 percent  
*Elevation:* 3,000 to 5,000 feet  
*Mean annual precipitation:* 15 to 19 inches  
*Frost-free period:* 105 to 120 days

**Composition**

**Major Components**

Bigarm and similar soils: 85 percent

## Minor Components

Bigarm very stony loam soils: 0 to 8 percent  
Hogsby and similar soils: 0 to 7 percent

## Major Component Description

*Surface layer texture:* Cobbly loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Somewhat excessively drained  
*Dominant parent material:* Colluvium  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 5.6 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

## Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## 12--Bigarm gravelly loam, 8 to 15 percent slopes

### Setting

*Landform:* Hills  
*Slope:* 8 to 15 percent  
*Elevation:* 3,000 to 4,000 feet  
*Mean annual precipitation:* 15 to 19 inches  
*Frost-free period:* 105 to 120 days

### Composition

#### Major Components

Bigarm and similar soils: 85 percent

#### Minor Components

Bigarm very stony loam soils: 0 to 5 percent  
Belton and similar soils: 0 to 5 percent  
Bowlake and similar soils: 0 to 3 percent  
Niarada and similar soils: 0 to 2 percent

## Major Component Description

*Surface layer texture:* Gravelly loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Somewhat excessively drained  
*Dominant parent material:* Colluvium  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 5.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

## Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## 13--Bigarm, cool-Hogsby-Rock outcrop complex, 30 to 60 percent slopes

### Setting

*Landform:*  
\* Bigarm--Mountains  
\* Hogsby--Mountains  
*Slope:*  
\* Bigarm--30 to 60 percent  
\* Hogsby--30 to 60 percent  
*Elevation:* 3,000 to 5,000 feet  
*Mean annual precipitation:* 15 to 19 inches  
*Frost-free period:* 105 to 120 days

### Composition

#### Major Components

Bigarm and similar soils: 50 percent  
Hogsby and similar soils: 20 percent  
Rock outcrop: 15 percent

#### Minor Components

Bigarm very stony loam soils: 0 to 8 percent  
Niarada and similar soils: 0 to 7 percent

## Major Component Description

### Bigarm

*Surface layer texture:* Gravelly loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Somewhat excessively drained  
*Dominant parent material:* Colluvium  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 5.1 inches

### Hogsby

*Surface layer texture:* Stony loam  
*Depth class:* Shallow (10 to 20 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Argillite residuum  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 1.6 inches

### Rock outcrop

*Definition:* Exposures of bare bedrock

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

## Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## 14--Bigarm, cool-Rubble land complex, 30 to 60 percent slopes

### Setting

*Landform:* Mountains  
*Slope:* 30 to 60 percent  
*Elevation:* 3,000 to 4,200 feet  
*Mean annual precipitation:* 15 to 19 inches  
*Frost-free period:* 105 to 120 days

## Composition

### Major Components

Bigarm and similar soils: 55 percent  
Rubble land: 30 percent

### Minor Components

Finleypoint and similar soils: 0 to 5 percent  
Hogsby and similar soils: 0 to 5 percent  
Rock outcrop areas: 0 to 5 percent

## Major Component Description

### Bigarm

*Surface layer texture:* Stony loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Somewhat excessively drained  
*Dominant parent material:* Colluvium  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 3.3 inches

### Rubble land

*Definition:* Areas that have more than 90 percent of the surface covered by stones and boulders

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

## Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## 15--Bigarm-Hogsby-Rock outcrop complex, 30 to 60 percent slopes

### Setting

*Landform:*  
\* Bigarm--Mountains  
\* Hogsby--Mountains

*Slope:*

\* Bigarm--30 to 60 percent

\* Hogsby--30 to 60 percent

*Elevation:* 3,000 to 5,500 feet

*Mean annual precipitation:* 15 to 19 inches

*Frost-free period:* 105 to 120 days

**Composition**

**Major Components**

Bigarm and similar soils: 50 percent

Hogsby and similar soils: 20 percent

Rock outcrop: 15 percent

**Minor Components**

Bigarm extremely stony soils: 0 to 5 percent

Niarada and similar soils: 0 to 5 percent

**Major Component Description**

**Bigarm**

*Surface layer texture:* Very gravelly loam

*Depth class:* Very deep (more than 60 inches)

*Drainage class:* Somewhat excessively drained

*Dominant parent material:* Colluvium

*Native plant cover type:* Rangeland

*Flooding:* None

*Available water capacity:* Mainly 4.6 inches

**Hogsby**

*Surface layer texture:* Gravelly loam

*Depth class:* Shallow (10 to 20 inches)

*Drainage class:* Well drained

*Dominant parent material:* Argillite residuum

*Native plant cover type:* Rangeland

*Flooding:* None

*Available water capacity:* Mainly 1.4 inches

**Rock outcrop**

*Definition:* Exposures of bare bedrock

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

**Management**

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

\* "Range" section

\* "Agronomy" section

\* "Recreation" section

\* "Wildlife Habitat" section

\* "Engineering" and "Soil Properties" sections

**16--Bigarm-Rock outcrop-Rubble land complex, 30 to 60 percent slopes**

**Setting**

*Landform:* Mountains

*Slope:* 30 to 60 percent

*Elevation:* 3,000 to 4,200 feet

*Mean annual precipitation:* 15 to 19 inches

*Frost-free period:* 105 to 120 days

**Composition**

**Major Components**

Bigarm and similar soils: 35 percent

Rock outcrop: 25 percent

Rubble land: 25 percent

**Minor Components**

Hogsby and similar soils: 0 to 8 percent

Finlspoint and similar soils: 0 to 7 percent

**Major Component Description**

**Bigarm**

*Surface layer texture:* Stony loam

*Depth class:* Very deep (more than 60 inches)

*Drainage class:* Somewhat excessively drained

*Dominant parent material:* Colluvium

*Native plant cover type:* Rangeland

*Flooding:* None

*Available water capacity:* Mainly 4.6 inches

**Rock outcrop**

*Definition:* Exposures of bare bedrock

**Rubble land**

*Definition:* Areas that have more than 90 percent of the surface covered by stones and boulders

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

**Management**

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## Bohnlly Series

Bohnlly series consists of very deep, poorly drained soils on flood plains. These soils formed in silty alluvium. Slope is 0 to 2 percent. Elevation is 2,500 to 3,500 feet. The average annual precipitation is 14 to 19 inches, average annual air temperature is 41 to 45 degrees F, and the frost-free period is 105 to 130 days.

**Taxonomic Class:** Fine-silty, mixed, frigid Typic Haplaquolls

### Typical Pedon

Bohnlly silt loam, 0 to 2 percent slopes, in an area of rangeland; approximately 300 feet west and 90 feet north of the southeast corner of sec. 13, T. 20 N., R. 20 W.

- A1--0 to 3 inches; very dark brown (10YR 2/2) moist, silt loam, dark grayish brown (10YR 4/2); strong fine and medium granular structure; slightly hard, very friable, slightly sticky and slightly plastic; neutral; abrupt smooth boundary.
- A2--3 to 8 inches; very dark brown (10YR 2/2) moist, silt loam, dark grayish brown (10YR 4/2); moderate medium subangular blocky structure parting to moderate medium granular; slightly hard, friable, slightly sticky and slightly plastic; many fine and medium roots; many fine and medium tubular pores; neutral; clear wavy boundary.
- Bw--8 to 17 inches; grayish brown (10YR 5/2) moist, silt loam, light brownish gray (10YR 6/2); common medium distinct strong brown (7.5YR 4/6) moist mottles; moderate medium subangular blocky structure parting to weak coarse platy; slightly hard, friable, slightly sticky and slightly plastic; many fine roots; many very fine tubular pores and common fine tubular pores; neutral; clear wavy boundary.
- Cg1--17 to 36 inches; grayish brown (10YR 5/2) moist, silt loam, light brownish gray (10YR 6/2); many medium prominent strong brown (7.5YR 5/6) and many fine faint gray (10YR 5/1) moist mottles; massive; hard, firm, slightly sticky and slightly plastic; common fine roots;

- many fine tubular pores; neutral; clear wavy boundary.
- Cg2--36 to 46 inches; grayish brown (10YR 5/2) moist, silty clay loam, brownish gray (10YR 6/2); many medium prominent strong brown (7.5YR 5/6) and many fine faint gray (10YR 5/1) moist mottles; massive; hard, firm, slightly sticky and slightly plastic; neutral; clear wavy boundary.
- Cg3--46 to 60 inches; gray (10YR 5/1) moist, fine sandy loam, stratified with thin lenses of fine sand and silt loam, light gray (10YR 6/1); many fine distinct strong brown (7.5YR 4/6) and many fine faint gray (10YR 5/1) moist mottles; massive; slightly hard, friable, slightly sticky and slightly plastic; neutral.

### Range in Characteristics

*Soil temperature:* 41 to 47 degrees F

*Moisture control section:* Between 4 and 12 inches

*Mollic epipedon thickness:* 7 to 12 inches

*Control section:* Less than 15 percent fine sand or coarser

*Depth to water table:* 6 to 24 inches

*Other features:* Some pedons have a 1- to 3-inch thick surface layer of peat or muck

#### A1, A2 horizons

Value: 3, 4, or 5 dry; 2 or 3 moist

Chroma: 1 or 2

Clay content: 18 to 27 percent

Reaction: pH 6.6 to 7.8

#### Bw horizon

Hue: 10YR or 2.5Y

Value: 3, 4, 5, or 6 dry; 2, 3, 4 or 5 moist

Chroma: 1 or 2

Redoximorphic features: 7.5YR 5/6 or 7.5YR 4/6

Clay content: 18 to 27 percent

Reaction: pH 6.6 to 7.8

#### Cg1, Cg2 horizons

Hue: 10YR, 2.5Y, or 5Y

Value: 5, 6, or 7 dry; 2, 3, 4 or 5 moist

Chroma: 1 or 2

Redoximorphic features: 7.5YR 5/6, 7.5YR 4/6, 10YR 5/1, or 10YR 4/1

Texture: Silt loam or silty clay loam

Clay content: 18 to 32 percent

Reaction: pH 6.6 to 7.8

#### Cg3 horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 6 or 7 dry; 4, 5, or 6 moist

Redoximorphic features: 7.5YR 5/6, 7.5YR 4/6, 10YR 5/1, or 10YR 4/1

Texture: Fine sandy loam consisting of thin strata of fine sand, very fine sand, and silt loam  
Clay content: 5 to 15 percent  
Content of rock fragments: 0 to 15 percent--0 to 5 percent cobbles, 0 to 10 percent pebbles  
Reaction: pH 6.6 to 7.8

## 17--Bohnlly silt loam, 0 to 2 percent slopes

### Setting

*Landform:* Flood plains  
*Slope:* 0 to 2 percent  
*Elevation:* 2,500 to 3,500 feet  
*Mean annual precipitation:* 14 to 19 inches  
*Frost-free period:* 105 to 130 days

### Composition

#### Major Components

Bohnlly and similar soils: 90 percent

#### Minor Components

Borochemists and similar soils: 0 to 2 percent  
Colake and similar soils: 0 to 8 percent

### Major Component Description

*Surface layer texture:* Silt loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Poorly drained  
*Dominant parent material:* Alluvium  
*Native plant cover type:* Rangeland  
*Flooding:* Occasional  
*Water table:* Apparent  
*Available water capacity:* Mainly 10.4 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section

\* "Engineering" and "Soil Properties" sections

## Bolack Series

Bolack series consists of very deep, poorly drained soils on floodplains. These soils formed in clayey alluvium. Slope is 0 to 2 percent. Elevation is 2,500 to 3,300 feet. The average annual precipitation is 13 to 18 inches, average annual air temperature is 41 to 45 degrees F, and the frost-free period is 105 to 120 days.

**Taxonomic Class:** Fine, mixed, frigid Typic Haplaquolls

### Typical Pedon

Bolack silt loam, 0 to 2 percent slopes, in an area of rangeland; approximately 1,800 feet east and 1,850 feet south of the northwest corner of sec. 1, T. 18 N., R. 20 W.

O--3 to 0 inches; peat.

A--0 to 10 inches; black (10YR 2/1) moist, silt loam, dark gray (10YR 4/1); weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; many fine irregular pores; neutral; clear smooth boundary.

Bg1--10 to 14 inches; dark gray (10YR 4/1) moist, silty clay loam, light gray (10YR 7/1); many fine distinct dark yellowish brown (10YR 4/6) mottles; weak medium subangular blocky structure; hard, firm, sticky and plastic; many fine and very fine roots; many fine and medium tubular pores; neutral; clear smooth boundary.

Bg2--14 to 25 inches; grayish brown (10YR 5/2) moist, clay, light gray (10YR 7/2); many medium distinct dark yellowish brown (10YR 4/4) moist mottles; moderate medium and coarse subangular blocky structure; very hard, extremely firm, very sticky and very plastic; common fine and medium roots; common fine tubular pores; mildly alkaline; gradual smooth boundary.

Bg3--25 to 44 inches; light brownish gray (10YR 6/2) moist, clay; light gray (10YR 7/2); many large distinct dark yellowish brown (10YR 4/4) moist mottles; moderate medium subangular blocky structure; very hard, extremely firm, very sticky and very plastic; few fine and medium roots; few fine tubular pores; mildly alkaline; gradual smooth boundary.

Cg--44 to 60 inches; light gray (10YR 6/1) moist, gravelly clay, white (10YR 8/1); many large

distinct dark yellowish brown (10YR 4/4) moist mottles; massive; very hard, extremely firm, very sticky and very plastic; 20 percent pebbles; slightly effervescent; moderately alkaline.

### Range in Characteristics

*Soil temperature:* 43 to 47 degrees F  
*Moisture control section:* Between 4 and 12 inches  
*Mollic epipedon thickness:* 7 to 15 inches  
*Content of clay in the control section:* 35 to 60 percent  
*Depth to seasonal water table:* 12 to 36 inches

#### *A horizon*

Value: 3, 4, or 5 dry; 2 or 3 moist  
Clay content: 18 to 27 percent  
Reaction: pH 6.6 to 7.3

#### *Bg1 horizon*

Value: 5, 6, or 7 dry; 3 or 4 moist  
Chroma: 1 or 2  
Texture: Silty clay or silty clay loam  
Clay content: 27 to 45 percent  
Reaction: pH 6.6 to 7.3

#### *Bg2, Bg3 horizons*

Hue: 5Y, 2.5Y, or 10YR  
Value: 5, 6, or 7 dry; 4, 5 or 6 moist  
Chroma: 0 or 1  
Mottles: 10YR 4/4, 10YR 4/6, or 10YR 6/1  
Texture: Clay or silty clay  
Clay content: 40 to 60 percent  
Reaction: pH 7.4 to 7.8

#### *Cg horizon*

Hue: 5Y, N, 2.5Y, or 10YR  
Value: 6, 7, or 8 dry; 4, 5, or 6 moist  
Chroma: 0, 1, or 2  
Mottles: 10YR 4/4, 10YR 4/6, or 10YR 6/1  
Texture: Clay or silty clay  
Clay content: 40 to 60 percent  
Content of rock fragments: 0 to 25 percent pebbles  
Reaction: pH 7.4 to 8.4

### Borohemists

Borohemists consist of very deep, very poorly drained soils on flood plains. These soils formed in peat underlain by alluvium. Slope is 0 to 1 percent. Elevation is 2,700 to 3,400 feet. The average annual precipitation is 15 to 22 inches, average annual air temperature is 42 to 47 degrees F, and the frost-free period is 80 to 105 days.

### Typical Pedon

Borohemists, in an area of rangeland; 700 feet south and 500 feet east of the northwest corner of sec. 6, T. 21 N., R. 19 W.

Oe--0 to 26 inches; black (10YR 2/1) moist; about 60 percent fiber, 20 percent rubbed fiber, and 40 percent hemic; medium acid; clear smooth boundary.

Cg--26 to 60 inches; light brownish gray (2.5Y 6/2) moist, silt loam, white (2.5Y 8/2); massive; slightly hard, very friable, nonsticky and nonplastic; neutral.

### Range in Characteristics

*Depth to seasonal water table:* 0 to 12 inches  
*Organic material thickness:* 16 to 60 inches

### 18--Bolack silt loam, 0 to 2 percent slopes

#### Setting

*Landform:* Flood plains  
*Slope:* 0 to 2 percent  
*Elevation:* 2,500 to 3,300 feet  
*Mean annual precipitation:* 13 to 18 inches  
*Frost-free period:* 105 to 120 days

#### Composition

##### Major Components

Bolack and similar soils: 85 percent

##### Minor Components

Bohnlly soils: 0 to 2 percent  
Borohemists and similar soils: 0 to 2 percent  
Very gravelly subsoil layers: 0 to 5 percent  
Very stony surface layers: 0 to 5 percent  
Sandy, wet soils: 0 to 1 percent

#### Major Component Description

*Surface layer texture:* Silt loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Poorly drained  
*Dominant parent material:* Alluvium  
*Native plant cover type:* Rangeland  
*Flooding:* Occasional  
*Water table:* Apparent  
*Available water capacity:* Mainly 9.9 inches

A typical soil description with range in characteristics is included, in alphabetical order, in

this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## 19--Borohemists, 0 to 1 percent slopes

### Setting

*Landform:* Flood plains  
*Slope:* 0 to 1 percent  
*Elevation:* 2,700 to 3,400 feet  
*Mean annual precipitation:* 15 to 22 inches  
*Frost-free period:* 80 to 105 days

### Composition

#### Major Components

Borohemists and similar soils: 90 percent

#### Minor Components

Somewhat poorly drained soils: 0 to 10 percent

### Major Component Description

*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Very poorly drained  
*Dominant parent material:* Peat  
*Flooding:* Frequent  
*Water table:* Apparent

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## Bowlake Series

Bowlake series consists of very deep, well drained soils on relict stream terraces. These soils formed in alluvium. Slope is 4 to 15 percent. Elevation is 2,900 to 3,400 feet. The average annual precipitation is 14 to 18 inches, average annual air temperature is 39 to 43 degrees F, and the frost-free period is 105 to 120 days.

**Taxonomic Class:** Fine, illitic, frigid Calcic Argixerolls

### Typical Pedon

Bowlake gravelly loam in an area of Bowlake-Minesinger gravelly loams, 8 to 15 percent slopes, in cropland; 1,000 feet south and 30 feet east of the northwest corner of sec. 31, T. 23 N., R. 21 W.

Ap--0 to 11 inches; grayish brown (10YR 5/2) gravelly loam, very dark grayish brown (10YR 3/2) moist; moderate fine and medium granular structure; soft, friable, slightly sticky and slightly plastic; many fine and medium roots; common fine pores; 10 percent pebbles and 5 percent cobbles; neutral; clear smooth boundary.

Bt/E--11 to 19 inches; 70 percent is pale brown (7.5YR 6/3) gravelly silty clay, brown (7.5YR 4/4) moist (B part); 30 percent is pinkish gray (7.5YR 7/2) gravelly silty clay loam, brown (7.5YR 5/2) moist (E part); brown (7.5YR 5/4) moist when mixed; moderate fine and medium subangular blocky structure; hard, firm, sticky and plastic; few coarse roots and common fine roots; many fine tubular pores; 10 percent pebbles and 5 percent cobbles; mildly alkaline; clear smooth boundary.

Bt1--19 to 26 inches; light brown (7.5YR 6/4) gravelly clay, brown (7.5YR 5/4) moist; weak medium prismatic structure parting to strong medium subangular blocky; hard, firm, sticky and plastic; common fine roots; many fine tubular pores; many continuous distinct clay films on ped faces and in tubular pores; 10 percent pebbles and 5 percent cobbles; mildly alkaline; clear smooth boundary.

Bt2--26 to 32 inches; light brown (7.5YR 6/4) gravelly clay, brown (7.5YR 5/4) moist; moderate fine and medium subangular blocky structure; hard, firm, sticky and plastic; common fine roots; many fine tubular pores; common continuous distinct clay films in tubular pores and on faces of peds; 10 percent pebbles and 5 percent cobbles; mildly alkaline; clear wavy boundary.

Bk--32 to 51 inches; pink (7.5YR 7/4) gravelly clay, brown (7.5YR 5/4) moist; weak fine and medium subangular blocky structure; hard, firm, sticky and plastic; few fine roots; many fine tubular pores; common fine masses and threads of lime; strongly effervescent; 10 percent pebbles and 5 percent cobbles; moderately alkaline; clear smooth boundary.

C--51 to 60 inches; light brown (7.5YR 6/4) gravelly sandy clay loam, strong brown (7.5YR 5/6) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; very few fine roots; few fine tubular pores; 15 percent pebbles and 5 percent cobbles; slightly effervescent; moderately alkaline.

### Range in Characteristics

*Soil temperature:* 41 to 45 degrees F

*Moisture control section:* Between 4 and 12 inches

*Mollic epipedon thickness:* 7 to 12 inches

*Content of clay in the control section:* 35 to 60 percent

*Depth to Bk horizon:* 15 to 36 inches

#### *Ap horizon*

Chroma: 2 or 3

Clay content: 20 to 27 percent

Content of rock fragments: 15 to 30 percent--0 to 10 percent cobbles and stones, 10 to 20 percent pebbles

Reaction: pH 6.6 to 7.8

#### *Bt/E horizon*

Hue: E part--7.5YR or 10YR, B part--7.5YR or 10YR

Value: E--part 7 or 8 dry and 2 or 3 moist; B part--5 or 6 dry and 4 or 5 moist

Chroma: E part--2 or 3; B part--2, 3, or 4

Texture: Silty clay loam, clay loam, or silty clay

Clay content: 30 to 40 percent

Content of rock fragments: 5 to 30 percent--0 to 10 percent cobbles and stones, 5 to 20 percent pebbles

Reaction: pH 6.6 to 7.8

#### *Bt horizons*

Hue: 7.5YR or 10YR

Value: 5, 6, or 7 dry; 4 or 5 moist

Chroma: 3, 4, or 6

Texture: Silty clay, silty clay loam, or clay

Clay content: 35 to 60 percent

Content of rock fragments: 5 to 25 percent--0 to 5 percent cobbles, 5 to 20 percent pebbles

Reaction: pH 7.4 to 8.4

#### *Bk horizon*

Hue: 7.5YR or 10YR

Value: 6 or 7 dry; 5 or 6 moist

Chroma: 3 or 4

Texture: Clay loam, silty clay, or clay

Clay content: 30 to 45 percent

Content of rock fragments: 5 to 60 percent--0 to 5 percent cobbles, 5 to 55 percent pebbles

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.4 to 8.4

#### *C horizon*

Hue: 7.5YR or 10YR

Value: 6, 7, or 8 dry; 5, 6, or 7 moist

Chroma: 2, 3, 4, or 6

Texture: Loam, clay loam, silty clay, silt loam, or sandy clay loam

Clay content: 20 to 45 percent

Content of rock fragments: 5 to 50 percent cobbles and 5 to 40 percent pebbles

Reaction: pH 7.9 to 8.4

## 20--Bowlake gravelly loam, 4 to 8 percent slopes

### Setting

*Landform:* Relict stream terraces

*Slope:* 4 to 8 percent

*Elevation:* 2,900 to 3,400 feet

*Mean annual precipitation:* 14 to 18 inches

*Frost-free period:* 105 to 120 days

### Composition

#### Major Components

Bowlake and similar soils: 85 percent

#### Minor Components

Minesinger and similar soils: 0 to 3 percent

Kerl and similar soils: 0 to 4 percent

Garceau gulch-indurated lime: 0 to 2 percent

Walstead and similar soils: 0 to 4 percent

Bowlake, stony loam: 0 to 2 percent

### Major Component Description

*Surface layer texture:* Gravelly loam

*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Alluvium  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 6.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## 21--Bowlake-Minesinger gravelly loams, 8 to 15 percent slopes

### Setting

*Landform:*

- \* Bowlake--Relict stream terraces
- \* Minesinger--Relict stream terraces

*Slope:*

- \* Bowlake--8 to 15 percent
- \* Minesinger--8 to 15 percent

*Elevation:* 2,900 to 3,400 feet

*Mean annual precipitation:* 14 to 18 inches

*Frost-free period:* 105 to 120 days

### Composition

#### Major Components

Bowlake and similar soils: 50 percent

Minesinger and similar soils: 35 percent

#### Minor Components

Kerl and similar soils: 0 to 4 percent

Nirada and similar soils: 0 to 4 percent

Bigarm and similar soils: 0 to 4 percent

Stony, very stony surfaces: 0 to 3 percent

### Major Component Description

#### Bowlake

*Surface layer texture:* Gravelly loam

*Depth class:* Very deep (more than 60 inches)

*Drainage class:* Well drained

*Dominant parent material:* Alluvium

*Native plant cover type:* Rangeland

*Flooding:* None

*Available water capacity:* Mainly 6.9 inches

#### Minesinger

*Surface layer texture:* Gravelly loam

*Depth class:* Very deep (more than 60 inches)

*Drainage class:* Well drained

*Dominant parent material:* Alluvium

*Native plant cover type:* Rangeland

*Flooding:* None

*Available water capacity:* Mainly 5.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

### Colake Series

Colake series consists of very deep, poorly drained and somewhat poorly drained soils in swales and depressions on till plains and stream terraces. These soils formed in calcareous alluvium. Slope is 0 to 3 percent. Elevation is 2,700 to 3,600 feet. The average annual precipitation is 15 to 18 inches, average annual air temperature is 42 to 45 degrees F, and the frost-free period is 105 to 120 days.

**Taxonomic Class:** Fine-silty, frigid Typic  
Calcicquolls

### Typical Pedon

Colake silt loam, 0 to 1 percent slopes, in an area of rangeland; approximately 100 feet south and 800 feet west of the northeast corner of sec. 35, T. 21 N., R. 20 W.

A--0 to 10 inches; dark gray (10YR 4/1) silt loam, black (10YR 2/1) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; many fine roots; many fine pores; disseminated lime; strongly effervescent; moderately alkaline; gradual irregular boundary.

Bkg--10 to 19 inches; gray (10YR 6/1) silt loam, very dark gray (10YR 3/1) moist; weak fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; common fine roots; common fine pores; disseminated lime; violently effervescent; moderately alkaline; clear irregular boundary.

Cg--19 to 60 inches; light gray (5Y 7/1) silt loam, light brownish gray (2.5Y 6/2) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; few fine roots; few fine pores; disseminated lime; violently effervescent; moderately alkaline.

### Range in Characteristics

*Soil temperature:* 44 to 47 degrees F

*Moisture control section:* Between 4 to 12 inches

*Mollic epipedon thickness:* 7 to 16 inches

*Content of clay in the control section:* 18 to 27 percent

*Depth to water table:* 12 to 24 inches; 24 to 36 inches in drained phase

*Depth to calcic horizon:* 8 to 16 inches

*Soil phases:* Drained

#### A horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 3 or 4 dry; 2 or 3 moist

Clay content: 18 to 27 percent

Reaction: pH 7.4 to 8.4

#### Bkg horizon

Hue: 10YR, 2.5Y, 5Y

Value: 5, 6, 7, or 8 dry; 3, 4, 5, or 6 moist

Chroma: 1 or 2

Clay content: 18 to 27 percent

Calcium carbonate equivalent: 15 to 40 percent

Reaction: pH 7.4 to 8.4

#### Cg horizon

Hue: 2.5Y or 5Y

Value: 5, 6, or 7 dry; 3, 4, 5, or 6 moist

Chroma: 1, 2, 3, or 4

Clay content: 18 to 27 percent

Reaction: pH 7.4 to 8.4

## 22--Colake silt loam, 0 to 1 percent slopes

### Setting

*Landform:* Till plains

*Slope:* 0 to 1 percent

*Elevation:* 2,700 to 3,600 feet

*Mean annual precipitation:* 15 to 18 inches

*Frost-free period:* 105 to 120 days

### Composition

#### Major Components

Colake and similar soils: 85 percent

#### Minor Components

Bohnlly and similar soils: 0 to 5 percent

Organic mat on surface: 0 to 5 percent

Somewhat poorly drained soils: 0 to 5 percent

### Major Component Description

*Surface layer texture:* Silt loam

*Depth class:* Very deep (more than 60 inches)

*Drainage class:* Poorly drained

*Dominant parent material:* Alluvium

*Native plant cover type:* Rangeland

*Flooding:* None

*Water table:* Apparent

*Available water capacity:* Mainly 10.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## 23--Colake silt loam, drained, 0 to 1 percent slopes

### Setting

*Landform:* Till plains  
*Slope:* 0 to 1 percent  
*Elevation:* 2,700 to 3,600 feet  
*Mean annual precipitation:* 15 to 18 inches  
*Frost-free period:* 105 to 120 days

### Composition

#### Major Components

Colake and similar soils: 85 percent

#### Minor Components

Colake, undrained: 0 to 5 percent  
McCollum and similar soils: 0 to 5 percent  
Jocko and similar soils: 0 to 5 percent

### Major Component Description

*Surface layer texture:* Silt loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Somewhat poorly drained  
*Dominant parent material:* Alluvium  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Water table:* Apparent  
*Available water capacity:* Mainly 10.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## 24--Colake-Sacheen complex, 0 to 3 percent slopes

### Setting

*Landform:*  
\* Colake--Stream terraces  
\* Sacheen--Stream terraces  
*Slope:*  
\* Colake--0 to 3 percent  
\* Sacheen--1 to 2 percent  
*Elevation:* 3,000 to 3,200 feet  
*Mean annual precipitation:* 15 to 18 inches  
*Frost-free period:* 105 to 120 days

### Composition

#### Major Components

Colake and similar soils: 60 percent  
Sacheen and similar soils: 25 percent

#### Minor Components

Borochemist soils: 0 to 5 percent  
McCollum and similar soils: 0 to 5 percent  
Indurated lime at 12 inches: 0 to 5 percent

### Major Component Description

#### Colake

*Surface layer texture:* Silt loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Poorly drained  
*Dominant parent material:* Alluvium  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Water table:* Apparent  
*Available water capacity:* Mainly 10.2 inches

#### Sacheen

*Surface layer texture:* Loamy fine sand  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Somewhat excessively drained  
*Dominant parent material:* Glaciofluvial deposits  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 6.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

## Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## Connah Series

Connah series consists of very deep, well drained soils on till plains. These soils formed in till derived from glaciolacustrine deposits. Slope is 0 to 8 percent. Elevation is 3,000 to 3,500 feet. The average annual precipitation is 15 to 20 inches, average annual air temperature is 42 to 45 degrees F, and the frost-free period is 90 to 105 days.

**Taxonomic Class:** Fine, illitic, frigid Typic Haploxeralfs

### Typical Pedon

Connah silt loam, 0 to 2 percent slopes, in an area of woodland; 1,300 feet east and 400 feet south of the northwest corner of sec. 4, T. 19 N., R. 19 W.

Oi--1 inch to 0; undecomposed needles and twigs.  
E--0 to 7 inches; very pale brown (10YR 7/3) silt loam, pale brown (10 YR 6/3) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many fine and medium roots; many very fine and fine tubular pores; 5 percent cobbles and 5 percent pebbles; medium acid; clear wavy boundary.

Bt/E--7 to 14 inches; 70 percent is light yellowish brown (10YR 6/4) silty clay, brown (10YR 5/3) moist (B part); 30 percent is very pale brown (10YR 7/3) silty clay loam, pale brown (10YR 6/3) moist (E part) that interfingers into the B part, yellowish brown (10YR 5/4) moist (when mixed); moderate medium subangular blocky structure; hard, firm, sticky and plastic; many fine and medium roots; many very fine and fine tubular pores; 5 percent cobbles and 5 percent pebbles; medium acid; clear wavy boundary.

Bt1--14 to 25 inches; light brown (7.5YR 6/4) clay, brown 7.5YR 5/4) moist; weak coarse

prismatic structure parting to strong medium subangular blocky; very hard, firm, sticky and plastic; common fine roots; many fine pores and common medium pores; many continuous distinct clay films in tubular pores and on faces of peds; 5 percent cobbles and 5 percent pebbles; medium acid; gradual wavy boundary.  
Bt2--25 to 34 inches; light brown (7.5YR 6/4) clay, brown 7.5YR 5/4) moist; moderate medium subangular blocky structure; very hard, firm, sticky and plastic; common fine roots; many fine tubular pores and common very fine tubular pores; few distinct clay films in tubular pores and on faces of peds; 5 percent cobbles and 5 percent pebbles; neutral; gradual wavy boundary.

Bk--34 to 47 inches; light gray (10YR 7/2) silty clay, yellowish brown (10YR 5/4) moist; weak medium subangular blocky structure; hard, firm, sticky and plastic; few fine roots; few very fine tubular pores; common fine soft threads and seams of lime; strongly effervescent; 5 percent cobbles and 5 percent pebbles; mildly alkaline; gradual wavy boundary.

C--47 to 60 inches; very pale brown (10YR 7/3) silty clay, pale brown (10YR 6/3) moist; massive; hard, firm, sticky and plastic; few fine roots; strongly effervescent; 5 percent cobbles and 5 percent pebbles; mildly alkaline.

### Range in Characteristics

*Soil temperature:* 44 to 47 degrees F

*Moisture control section:* Between 4 and 12 inches

*Control section:* 40 to 60 percent clay and 0 to 10 percent rock fragments

*Depth to Bk horizon:* 28 to 41 inches

*Other features:* Some pedons have a thin dark colored A horizon that when mixed to a depth of 7 inches will not meet the requirements for a mollic epipedon

#### *E horizon*

Value: 6 or 7 dry; 5 or 6 moist

Chroma: 2 or 3

Texture: Silt loam or silty clay loam

Clay content: 10 to 35 percent

Content of rock fragments: 0 to 20 percent--0 to 10 percent cobbles and stones, 0 to 10 percent pebbles

Reaction: pH 5.6 to 6.5

#### *Bt/E horizon*

Value: B part--5 or 6 dry and 4 or 5 moist; E part--6 or 7 dry and 4, 5, or 6 moist

Chroma: B part--3, 4, or 5; E part--3 or 4  
Texture: B part--silty clay loam, silty clay or clay; E part--silty clay loam or silt loam  
Clay content: B part--40 to 50 percent, E part--30 to 40 percent; mixed--35 to 45 percent  
Content of rock fragments: 0 to 10 percent--0 to 5 percent cobbles, 0 to 5 percent pebbles  
Reaction: pH 5.6 to 6.5

*Bt horizons*

Hue: 7.5YR or 10YR  
Value: 5 or 6 dry; 4 or 5 moist  
Chroma: 3 or 4  
Texture: Clay or silty clay  
Clay content: 40 to 60 percent  
Content of rock fragments: 0 to 10 percent--0 to 5 percent cobbles, 0 to 5 percent pebbles  
Reaction: pH 5.6 to 7.3

*Bk horizon*

Hue: 7.5YR or 10YR  
Value: 6 or 7 dry; 5 or 6 moist  
Chroma: 2, 3, or 4  
Texture: Silty clay or silty clay loam  
Clay content: 35 to 50 percent  
Content of rock fragments: 0 to 10 percent--0 to 5 percent cobbles, 0 to 5 percent pebbles  
Calcium carbonate equivalent: 5 to 15 percent  
Reaction: pH 7.4 to 8.4

*C horizon*

Hue: 10YR or 7.5YR  
Value: 6 or 7 dry; 5 or 6 moist  
Chroma: 3 or 4  
Texture: Silty clay loam or silty clay  
Clay content: 35 to 50 percent  
Content of rock fragments: 0 to 10 percent--0 to 5 percent cobbles, 0 to 5 percent pebbles  
Reaction: pH 7.4 to 8.4

**25--Connah cobbly silt loam, 4 to 8 percent slopes**

**Setting**

*Landform:* Till plains  
*Slope:* 4 to 8 percent  
*Elevation:* 3,000 to 3,500 feet  
*Mean annual precipitation:* 15 to 20 inches  
*Frost-free period:* 90 to 105 days

**Composition**

**Major Components**

Connah and similar soils: 85 percent

**Minor Components**

McDonald and similar soils: 0 to 5 percent  
Rumblecreek and similar soils: 0 to 5 percent

Areas of short, steep slopes: 0 to 2 percent  
Poorly drained soils: 0 to 2 percent  
Areas of water: 0 to 1 percent

**Major Component Description**

*Surface layer texture:* Cobbly silt loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Till  
*Native plant cover type:* Forest land  
*Flooding:* None  
*Available water capacity:* Mainly 10.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

**Management**

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Forest Land" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

**26--Connah silt loam, 0 to 2 percent slopes**

**Setting**

*Landform:* Till plains  
*Slope:* 0 to 2 percent  
*Elevation:* 3,000 to 3,500 feet  
*Mean annual precipitation:* 15 to 20 inches  
*Frost-free period:* 90 to 105 days

**Composition**

**Major Components**

Connah and similar soils: 85 percent

**Minor Components**

McDonald and similar soils: 0 to 5 percent  
Rumblecreek and similar soils: 0 to 5 percent  
Areas of water: 0 to 3 percent  
Poorly drained soils: 0 to 2 percent

## Major Component Description

*Surface layer texture:* Silt loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Till  
*Native plant cover type:* Forest land  
*Flooding:* None  
*Available water capacity:* Mainly 10.4 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

## Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Forest Land" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## 27--Connah-Water complex, 2 to 4 percent slopes

### Setting

*Landform:* Till plains  
*Slope:* 2 to 4 percent  
*Elevation:* 3,000 to 3,500 feet  
*Mean annual precipitation:* 15 to 20 inches  
*Frost-free period:* 90 to 105 days

### Composition

#### Major Components

Connah and similar soils: 65 percent  
Water: 20 percent

#### Minor Components

McDonald and similar soils: 0 to 4 percent  
Rumblecreek and similar soils: 0 to 4 percent  
Somewhat poorly drained soils: 0 to 3 percent  
Cobbly surface layer: 0 to 2 percent  
Poorly drained soils: 0 to 2 percent

## Major Component Description

### Connah

*Surface layer texture:* Silty clay loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Till  
*Native plant cover type:* Forest land  
*Flooding:* None  
*Available water capacity:* Mainly 10.5 inches

### Water

*Definition:* Areas of open water

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

## Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Forest Land" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## Courville Series

Courville series consists of very deep, well drained soils on moraines and outwash plains. These soils formed in alpine till derived from argillite and quartzite. The soils have a surface layer of volcanic ash-influenced loess. Slope is 4 to 60 percent. Elevation is 3,000 to 6,000 feet. The average annual precipitation is 25 to 45 inches, average annual air temperature is 38 to 43 degrees F, and the frost-free period is 60 to 90 days.

**Taxonomic Class:** Loamy-skeletal, mixed, frigid Andic Eutrochrepts

## Typical Pedon

Courville gravelly silt loam, 30 to 60 percent slopes, in an area of woodland; approximately

600 feet south and 700 feet east of the northwest corner of sec. 27, T. 22 N., R. 19 W.

Oe--1 inch to 0; partially decomposed needles and twigs.

A--0 to 3 inches; dark grayish brown (10YR 4/2) gravelly silt loam, black (10YR 2/1) moist; weak fine subangular blocky structure; soft, very friable, nonsticky and slightly plastic; 30 percent pebbles; slightly acid; clear smooth boundary.

Bs--3 to 13 inches; pale brown (10YR 6/3) gravelly silt loam, dark brown (10YR 3/3) moist; weak medium subangular blocky structure; soft, very friable, nonsticky and slightly plastic; 25 percent pebbles and 5 percent cobbles; slightly acid; clear wavy boundary.

2E--13 to 32 inches; very pale brown (10YR 7/3) very gravelly sandy loam, brown (10YR 5/3) moist; massive; loose, nonsticky and nonplastic; 55 percent pebbles and 5 percent cobbles; medium acid; clear wavy boundary.

2E/Bw--32 to 38 inches; 80 percent is white (10YR 8/2) very gravelly sandy loam, light brownish gray (10YR 6/2) moist (E part); 20 percent is yellowish brown (10YR 5/4) very gravelly sandy loam, dark yellowish brown (10YR 4/4) moist (B part); massive; slightly hard, friable, slightly sticky and slightly plastic; 50 percent pebbles, 10 percent cobbles; medium acid; clear wavy boundary.

2Bw/E--38 to 60 inches; B part (75 percent) is yellowish brown (10YR 5/6) very gravelly sandy loam, dark yellowish brown (10YR 4/6) moist; E part (25 percent) is white (10YR 8/2) very gravelly sandy loam, light brownish gray (10YR 6/2) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; 50 percent pebbles, 10 percent cobbles; medium acid.

### Range in Characteristics

*Soil temperature:* 40 to 45 degrees F

*Moisture control section:* Between 8 and 24 inches

*Control section:* 5 to 18 percent clay and 35 to 60 percent rock fragments (mainly argillite and quartzite)

*Other features:* Some pedons are calcareous below a depth of 40 inches

#### *A horizon*

Hue: 7.5YR or 10YR

Value: 4 or 5 dry; 2 or 3 moist

Chroma: 1 or 2

Clay content: 7 to 15 percent

Content of rock fragments: 15 to 35 percent--0 to 5 percent cobbles and stones, 15 to 30 percent pebbles

Bulk density: 1.0 grams per cubic centimeter or less

Reaction: pH 5.6 to 6.5

#### *Bs horizon*

Hue: 7.5YR or 10YR

Value: 5 or 6 dry; 3 or 4 moist

Chroma: 3 or 4

Texture: Silt loam or loam

Clay content: 7 to 15 percent

Content of rock fragments: 15 to 35 percent--0 to 5 percent cobbles and stones, 15 to 30 percent pebbles

Bulk density: 1.0 grams per cubic centimeter or less

Reaction: pH 5.6 to 6.5

#### *2E horizon*

Hue: 7.5YR or 10YR

Value: 6, 7, or 8 dry; 4, 5, or 6 moist

Chroma: 2 or 3

Texture: Loam, sandy loam, fine sandy loam, or silt loam

Clay content: 5 to 18 percent

Content of rock fragments: 35 to 60 percent--0 to 20 percent cobbles and stones, 25 to 55 percent pebbles

Reaction: pH 5.6 to 7.3

#### *2E/Bw horizon*

Hue: E part--7.5YR or 10YR, B part--7.5YR or 10YR

Value: E part--6, 7, or 8 dry and 4, 5, or 6 moist; B part--5 or 6 dry and 4 or 5 moist

Chroma: E part--2 or 3; B part--3 or 4

Texture: Loam, silt loam, fine sandy loam, or sandy loam

Clay content: 10 to 25 percent

Content of rock fragments: 35 to 60 percent--0 to 20 percent cobbles and stones, 25 to 50 percent pebbles

Reaction: pH 5.6 to 7.3

#### *2Bw/E horizon*

Hue: B part--7.5YR or 10YR, E part--7.5YR or 10YR

Value: B part--5 or 6 dry and 4 or 5 moist; E part--6, 7, or 8 dry and 4, 5, or 6 moist

Chroma: B part--3, 4, or 6; E part--2 or 3

Texture: Loam, silt loam, fine sandy loam, or sandy loam

Clay content: 10 to 25 percent

Content of rock fragments: 35 to 60 percent--0 to 20 percent cobbles and stones, 25 to 50 percent pebbles

Reaction: pH 5.6 to 7.3

## 28--Courville gravelly silt loam, 4 to 15 percent slopes

### Setting

*Landform:* Moraines  
*Slope:* 4 to 15 percent  
*Elevation:* 3,200 to 6,000 feet  
*Mean annual precipitation:* 25 to 45 inches  
*Frost-free period:* 60 to 90 days

### Composition

#### Major Components

Courville and similar soils: 90 percent

#### Minor Components

Mitten and similar soils: 0 to 5 percent  
Winfall and similar soils: 0 to 5 percent

### Major Component Description

*Surface layer texture:* Gravelly silt loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Alpine till  
*Native plant cover type:* Forest land  
*Flooding:* None  
*Available water capacity:* Mainly 6.4 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Forest Land" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## 29--Courville gravelly silt loam, 15 to 30 percent slopes

### Setting

*Landform:* Moraines  
*Slope:* 15 to 30 percent  
*Elevation:* 3,200 to 6,000 feet  
*Mean annual precipitation:* 25 to 45 inches  
*Frost-free period:* 60 to 90 days

### Composition

#### Major Components

Courville and similar soils: 85 percent

#### Minor Components

Mitten soils on summits: 0 to 5 percent  
Wildgen soils on south aspects: 0 to 5 percent  
Winfall and similar soils: 0 to 5 percent

### Major Component Description

*Surface layer texture:* Gravelly silt loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Alpine till  
*Native plant cover type:* Forest land  
*Flooding:* None  
*Available water capacity:* Mainly 6.4 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Forest Land" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

### 30--Courville gravelly silt loam, 30 to 60 percent slopes

#### Setting

*Landform:* Moraines  
*Slope:* 30 to 60 percent  
*Elevation:* 3,200 to 6,000 feet  
*Mean annual precipitation:* 25 to 45 inches  
*Frost-free period:* 60 to 90 days

#### Composition

##### Major Components

Courville and similar soils: 85 percent

##### Minor Components

Mitten soils on summits: 0 to 3 percent  
Wildgen soils on south aspects: 0 to 5 percent  
Winfall and similar soils: 0 to 5 percent  
Rock outcrop on summits: 0 to 2 percent

#### Major Component Description

*Surface layer texture:* Gravelly silt loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Alpine till  
*Native plant cover type:* Forest land  
*Flooding:* None  
*Available water capacity:* Mainly 6.3 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

#### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Forest Land" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

### 31--Courville gravelly silt loam, warm, 4 to 15 percent slopes

#### Setting

*Landform:* Moraines  
*Slope:* 4 to 15 percent  
*Elevation:* 3,200 to 5,000 feet  
*Mean annual precipitation:* 25 to 35 inches  
*Frost-free period:* 70 to 90 days

#### Composition

##### Major Components

Courville and similar soils: 90 percent

##### Minor Components

Mitten soils on summits: 0 to 5 percent  
Wildgen and similar soils: 0 to 5 percent

#### Major Component Description

*Surface layer texture:* Gravelly silt loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Alpine till  
*Native plant cover type:* Forest land  
*Flooding:* None  
*Available water capacity:* Mainly 6.0 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

#### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Forest Land" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## 32--Courville gravelly silt loam, warm, 15 to 30 percent slopes

### Setting

*Landform:* Moraines  
*Slope:* 15 to 30 percent  
*Elevation:* 3,200 to 5,000 feet  
*Mean annual precipitation:* 25 to 35 inches  
*Frost-free period:* 60 to 90 days

### Composition

#### Major Components

Courville and similar soils: 85 percent

#### Minor Components

Mitten soils on summits: 0 to 5 percent  
Wildgen and similar soils: 0 to 5 percent  
Tevis soils on summits: 0 to 5 percent

### Major Component Description

*Surface layer texture:* Gravelly silt loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Alpine till  
*Native plant cover type:* Forest land  
*Flooding:* None  
*Available water capacity:* Mainly 6.0 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Forest Land" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## 33--Courville gravelly silt loam, warm, 30 to 60 percent slopes

### Setting

*Landform:* Moraines  
*Slope:* 30 to 60 percent  
*Elevation:* 3,200 to 5,000 feet  
*Mean annual precipitation:* 25 to 35 inches  
*Frost-free period:* 60 to 90 days

### Composition

#### Major Components

Courville and similar soils: 85 percent

#### Minor Components

Mitten soils on summits: 0 to 3 percent  
Wildgen soils on south aspects: 0 to 5 percent  
Tevis soils on summits: 0 to 5 percent  
Rock outcrop on summits: 0 to 2 percent

### Major Component Description

*Surface layer texture:* Gravelly silt loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Alpine till  
*Native plant cover type:* Forest land  
*Flooding:* None  
*Available water capacity:* Mainly 6.0 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Forest Land" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## 34--Courville-Rumblecreek complex, 8 to 30 percent slopes

### Setting

#### *Landform:*

- \* Courville--Moraines
- \* Rumblecreek--Moraines

#### *Slope:*

- \* Courville--8 to 30 percent
- \* Rumblecreek--8 to 30 percent

*Elevation:* 3,700 to 4,800 feet

*Mean annual precipitation:* 25 to 30 inches

*Frost-free period:* 60 to 90 days

### Composition

#### Major Components

Courville and similar soils: 50 percent

Rumblecreek and similar soils: 35 percent

#### Minor Components

Aeric Haplaquept soils: 0 to 2 percent

Mitten and similar soils: 0 to 7 percent

Winfall and similar soils: 0 to 6 percent

### Major Component Description

#### **Courville**

*Surface layer texture:* Gravelly silt loam

*Depth class:* Very deep (more than 60 inches)

*Drainage class:* Well drained

*Dominant parent material:* Alpine till

*Native plant cover type:* Forest land

*Flooding:* None

*Available water capacity:* Mainly 6.4 inches

#### **Rumblecreek**

*Surface layer texture:* Gravelly loam

*Depth class:* Very deep (more than 60 inches)

*Drainage class:* Well drained

*Dominant parent material:* Alpine till

*Native plant cover type:* Forest land

*Flooding:* None

*Available water capacity:* Mainly 5.5 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Forest Land" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

### Craddock Series

Craddock series consists of very deep, somewhat excessively drained soils on mountain slopes. These soils formed in colluvium derived from thinly bedded soft weathered argillites. The soils have a surface layer of volcanic ash-influenced loess. Slope is 4 to 60 percent. Elevation is 5,200 to 6,400 feet. The average annual precipitation is 30 to 60 inches, average annual air temperature is 37 to 42 degrees F, and the frost-free period is 40 to 60 days.

**Taxonomic Class:** Coarse-loamy, mixed Andic Cryochrepts

### Typical Pedon

Craddock silt loam, 15 to 30 percent slopes, in an area of woodland; approximately 400 feet north and 1,600 feet east of the southwest corner of sec. 8, T. 23 N., R. 18 W.

Oe--1 inch to 0; partially decomposed forest litter.  
E--0 to 1 inch; light brownish gray (10YR 6/2) silt loam, dark grayish brown (10YR 4/2); weak fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine, fine, and medium roots and common coarse roots; 5 percent hard shale channers and 5 percent soft shale fragments; medium acid; abrupt wavy boundary.

Bs--1 to 10 inches; light yellowish brown (10YR 6/4) silt loam, dark yellowish brown (10YR 4/4) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; many very

fine, fine, and medium roots and common coarse roots; 10 percent hard shale channers and 10 percent soft shale fragments; medium acid; clear wavy boundary.

2E--10 to 33 inches; pale brown (10YR 6/3) channery loam, brown (10YR 4/3) moist; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine and fine roots and few medium roots; common fine tubular pores; 5 percent flagstones, 25 percent hard shale channers, and 25 percent soft shale fragments; medium acid; clear wavy boundary.

2E/Bw--33 to 60 inches; 75 percent is pale brown (10YR 6/3) channery loam, brown (10YR 4/3) moist (E part); 25 percent is light yellowish brown (2.5Y 6/4) channery loam, light olive brown (2.5Y 5/4) moist (B part); weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; few very fine and fine roots; many medium and coarse interstitial pores; 5 percent flagstones, 25 percent hard shale channers, and 20 percent soft shale fragments; medium acid.

### Range in Characteristics

*Soil temperature:* 39 to 44 degrees F

*Moisture control section:* Between 8 and 24 inches

*Control section:* 5 to 10 percent and 40 to 75 percent silt and very fine sand

#### *E horizon*

Hue: 10YR or 7.5Y

Value: 6 or 7 dry; 4, 5, or 6 moist

Chroma: 2 or 3

Clay content: 5 to 10 percent

Content of rock fragments: 0 to 55 percent--0 to 20 percent hard shale channers, 0 to 25 percent soft shale fragments

Reaction: pH 5.6 to 6.5

#### *Bs horizon*

Hue: 10YR or 7.5YR

Value: 5 or 6 dry; 4 to 5 moist

Chroma: 4 or 6

Texture: Silt loam or loam

Clay content: 5 to 10 percent

Content of rock fragments: 0 to 55 percent--0 to 20 percent hard shale channers, 0 to 25 percent soft shale fragments

Bulk density: 1.0 grams per cubic centimeter or less

Reaction: pH 5.6 to 6.5

#### *2E horizon*

Hue: 10YR or 2.5Y

Value: 6, 7, or 8 dry; 4, 5, or 6 moist

Chroma: 2, 3, or 4

Texture: Silt loam or loam

Clay content: 5 to 10 percent

Content of rock fragments: 15 to 60 percent--0 to 35 percent hard shale channers and flagstones, 10 to 25 percent shale fragments

Reaction: pH 5.6 to 6.5

#### *2E/Bw horizon*

Hue: E part--10YR or 2.5Y; B part--10YR or 7.5Y

Value: E part--6 or 7; B part--5 or 6 dry; E part--4, 5 or 6; B part--4 or 5 moist

Chroma: E part--2, 3, or 4; B part--3 or 4

Texture: Silt loam or loam

Clay content: 5 to 10 percent

Content of rock fragments: 15 to 60 percent--5 to 35 percent hard shale channers and flagstones, 10 to 25 percent soft shale fragments

Reaction: pH 5.6 to 6.5

## 35--Craddock channery silt loam, 30 to 60 percent slopes

### Setting

*Landform:* Mountains

*Slope:* 30 to 60 percent

*Elevation:* 5,200 to 6,400 feet

*Mean annual precipitation:* 30 to 60 inches

*Frost-free period:* 40 to 60 days

### Composition

#### Major Components

Craddock and similar soils: 90 percent

#### Minor Components

Holloway and similar soils: 0 to 10 percent

### Major Component Description

*Surface layer texture:* Channery silt loam

*Depth class:* Very deep (more than 60 inches)

*Drainage class:* Somewhat excessively drained

*Dominant parent material:* Colluvium

*Native plant cover type:* Forest land

*Flooding:* None

*Available water capacity:* Mainly 6.9 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is

available in the "Soil Properties" section, Part II, of this publication.

### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Forest Land" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

### 36--Craddock silt loam, 4 to 15 percent slopes

#### Setting

*Landform:* Mountains  
*Slope:* 4 to 15 percent  
*Elevation:* 5,200 to 6,400 feet  
*Mean annual precipitation:* 30 to 60 inches  
*Frost-free period:* 40 to 60 days

#### Composition

##### Major Components

Craddock and similar soils: 90 percent

##### Minor Components

Holloway and similar soils: 0 to 5 percent  
Waldbillig and similar soils: 0 to 5 percent

#### Major Component Description

*Surface layer texture:* Silt loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Somewhat excessively drained  
*Dominant parent material:* Colluvium  
*Native plant cover type:* Forest land  
*Flooding:* None  
*Available water capacity:* Mainly 7.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Forest Land" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

### 37--Craddock silt loam, 15 to 30 percent slopes

#### Setting

*Landform:* Mountains  
*Slope:* 15 to 30 percent  
*Elevation:* 5,200 to 6,400 feet  
*Mean annual precipitation:* 30 to 60 inches  
*Frost-free period:* 40 to 60 days

#### Composition

##### Major Components

Craddock and similar soils: 90 percent

##### Minor Components

Holloway and similar soils: 0 to 5 percent  
Waldbillig and similar soils: 0 to 5 percent

#### Major Component Description

*Surface layer texture:* Silt loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Somewhat excessively drained  
*Dominant parent material:* Colluvium  
*Native plant cover type:* Forest land  
*Flooding:* None  
*Available water capacity:* Mainly 7.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Forest Land" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## Doker Series

Doker series consists of very deep, poorly drained soils on floodplains. They have a volcanic ash influenced mantle more than 14 inches thick. These soils formed in alluvium. Slope is 0 to 2 percent. Elevation is 2,950 to 3,100 feet. The average annual precipitation is 14 to 19 inches, average annual air temperature is 40 to 45 degrees F, and the frost-free period is 105 to 130 days.

**Taxonomic Class:** Ashy over loamy, mixed, frigid Typic Vitraquands

### Typical Pedon

Doker silt loam, 0 to 2 percent slopes, in an area of pasture; approximately 450 feet west and 2,000 feet south of the northeast corner of sec. 14, T. 21 N., R. 20 W.

A--0 to 7 inches; black (10YR 2/1) silt loam, dark grayish brown (10YR 4/2) dry; common fine distinct dark yellowish brown (10YR 4/6) dry mottles; moderate fine and medium granular structure; soft, very friable, slightly sticky and slightly plastic; many fine and medium roots; common very fine and fine tubular pores; slightly acid; abrupt smooth boundary.

Bs1--7 to 13 inches; dark yellowish brown (10YR 4/4) silt loam, light yellowish brown (10YR 6/4) dry; common fine distinct yellowish brown (10YR 5/6) dry mottles; weak medium subangular blocky structure; soft, very friable, nonsticky and slightly plastic; many fine and medium roots; common very fine tubular pores; slightly acid; abrupt smooth boundary.

Bsg--13 to 15 inches; dark grayish brown (2.5Y 4/2) silt loam, light brownish gray (2.5Y 6/2) dry; many fine and medium prominent yellowish brown (10YR 5/6) mottles, many medium prominent dark yellowish brown (10YR 4/6, 3/6) mottles in root channels; massive; slightly hard, firm, slightly sticky and slightly plastic; many fine and medium roots; common very fine tubular pores; 1/2- to 3/4-inch thick

band of very dark gray (10YR 3/1) silt loam; slightly acid; abrupt smooth boundary.  
 2Cg1--15 to 22 inches; dark gray (5Y 4/1) fine sandy loam, grayish brown (2.5Y 5/2) dry; many fine and medium prominent yellowish brown (10YR 5/6) mottles, many medium prominent dark yellowish brown (10YR 4/6, 3/6) mottles in root channels; massive; soft, friable, slightly sticky and slightly plastic; many fine and medium roots; common very fine tubular pores; neutral; clear smooth boundary.  
 2Cg2--22 to 38 inches; gray (5Y 5/1) fine sandy loam, light brownish gray (2.5Y 6/2) dry; few faint distinct yellowish brown (10YR 5/6) mottles; massive; loose, nonsticky and nonplastic; neutral; gradual smooth boundary.  
 2Cg3--38 to 60 inches; gray (5Y 5/1) fine sandy loam, light gray (5Y 7/1) dry; few faint distinct yellowish brown (10YR 5/6) mottles; massive; loose, nonsticky and nonplastic; neutral.

### Range in Characteristics

*Soil temperature:* 43 to 47 degrees F

*Moisture control section:* Between 4 to 12 inches

*Depth to water table:* 0 to 24 inches

*Other features:* Some pedons have a 1- to 3-inch surface layer of peat or muck

#### A horizon

Hue: 10YR or 2.5Y

Value: 2 or 3 moist; 3 or 4 dry

Chroma: 1 or 2

Clay content: 18 to 27 percent

Bulk density: Less than .90 grams per cubic centimeter

Reaction: pH 6.1 to 7.3

#### Bs horizon

Hue: 10YR or 2.5Y

Value: 4 or 5 moist; 5 or 6 dry

Chroma: 4 or 6

Clay content: 5 to 10 percent

Bulk density: Less than .9 grams per cubic centimeter

Reaction: 6.1 to 7.3

#### Bsg horizon

Hue: 10YR or 2.5Y

Value: 4 or 5 moist; 5 or 6 dry

Chroma: Matrix chroma of 2, gleying masks the high chroma matrix colors

Clay content: 5 to 10 percent

Bulk density: Less than .9 grams per cubic centimeter

Reaction: pH 6.1 to 7.3

#### 2Cg horizons

Hue: 10YR, 2.5Y, or 5Y

Value: 4 or 5 moist; 5, 6, or 7 dry  
Chroma: 1 or 2  
Clay content: 8 to 18 percent  
Reaction: pH 6.1 to 7.3

## 38--Doker silt loam, 0 to 2 percent slopes

### Setting

*Landform:* Flood plains  
*Slope:* 0 to 2 percent  
*Elevation:* 2,950 to 3,100 feet  
*Mean annual precipitation:* 14 to 19 inches  
*Frost-free period:* 105 to 130 days

### Composition

#### Major Components

Doker and similar soils: 85 percent

#### Minor Components

Bohnly soils: 0 to 10 percent  
Borohemists: 0 to 5 percent

### Major Component Description

*Surface layer texture:* Silt loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Poorly drained  
*Dominant parent material:* Alluvium  
*Native plant cover type:* Rangeland  
*Flooding:* Occasional  
*Water table:* Apparent  
*Available water capacity:* Mainly 9.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## Dryfork Series

Dryfork series consists of very deep, well drained and moderately well drained soils on lake plains, flood plains, and stream terraces. These soils formed in eolian and glaciolacustrine deposits. Slope is 0 to 15 percent. Elevation is 2,600 to 3,500 feet. The average annual precipitation is about 10 to 17 inches, average annual air temperature is 41 to 45 degrees F. The frost-free period is 105 to 120 days.

**Taxonomic Class:** Coarse-silty, mixed, frigid Calcixerollic Xerochrepts

### Typical Pedon

Dryfork silt loam, 0 to 4 percent slopes, in an area of pasture; about 1,800 feet north and 300 feet west of the southeast corner of sec. 32, T. 23 N., R. 23 W.

- A--0 to 10 inches; pale brown (10YR 6/3) silt loam, brown (10YR 4/3) moist; weak fine and medium granular structure; soft, very friable, slightly sticky and slightly plastic; many fine roots; neutral; clear smooth boundary.
- Bw--10 to 16 inches; very pale brown (10YR 7/3) silt loam, light yellowish brown (10YR 6/4) moist; moderate medium subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; common fine roots; moderately alkaline; clear wavy boundary.
- Bk1--16 to 25 inches; light gray (10YR 7/2) silt loam, light yellowish brown (10YR 6/4) moist; massive; slightly hard, firm, sticky and slightly plastic; common fine roots; disseminated lime and few faint soft masses of lime; strongly effervescent; strongly alkaline; clear smooth boundary.
- Bk2--25 to 31 inches; light gray (10YR 7/2) silt loam, light brownish gray (10YR 6/2) moist; massive; soft, very friable, slightly sticky and slightly plastic; few very fine roots; disseminated lime and few faint soft masses of lime; strongly effervescent; very strongly alkaline; clear smooth boundary.
- C--31 to 60 inches; light gray (10YR 7/2) silt loam, light brownish gray (10YR 6/2) moist; massive; loose, very friable, nonsticky and nonplastic; strongly alkaline.

### Range in Characteristics

*Soil temperature:* 43 to 47 degrees F

*Moisture control section:* Between 4 and 12 inches

*Depth to Bk horizon:* 11 to 20 inches

*Depth to water table:* 36 to 48 inches in moderately wet phase

#### *A horizon*

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2, 3, or 4

Clay content: 10 to 15 percent

Electrical conductivity: less than 2 mmhos/cm

Sodium adsorption ratio: 4 to 13

Reaction: pH 6.6 to 7.3

#### *Bw horizon*

Hue: 2.5Y or 10YR

Value: 6, 7, or 8 dry; 4, 5, or 6 moist

Chroma: 2, 3, or 4

Clay content: 10 to 18 percent

Electrical conductivity: 2 to 4 mmhos/cm

Sodium adsorption ratio: 13 to 40

Reaction: pH 7.9 to 9.0

#### *Bk horizons*

Hue: 2.5Y or 10YR

Value: 6, 7, or 8 dry; 5, 6, or 7 moist

Chroma: 2, 3, or 4

Clay content: 5 to 18 percent

Calcium carbonate equivalent: 5 to 15 percent

Electrical conductivity: 2 to 4 mmhos/cm

Sodium adsorption ratio: 13 to 40

Reaction: pH 7.9 to 9.6

#### *C horizon*

Hue: 2.5Y, 5Y, or 10YR

Value: 6, 7, or 8 dry; 5, 6, or 7 moist

Texture: Silt loam or fine sandy loam

Clay content: 5 to 15 percent

Electrical conductivity: 1 to 3 mmhos/cm

Sodium adsorption ratio: 4 to 30

Reaction: pH 7.9 to 9.6

### **39--Dryfork silt loam, 0 to 4 percent slopes**

#### **Setting**

*Landform:* Stream terraces

*Slope:* 0 to 4 percent

*Elevation:* 2,700 to 3,000 feet

*Mean annual precipitation:* 10 to 14 inches

*Frost-free period:* 105 to 120 days

#### **Composition**

##### **Major Components**

Dryfork and similar soils: 90 percent

##### **Minor Components**

Kerrdam and similar soils: 0 to 4 percent

Selow and similar soils: 0 to 3 percent

Irvine and similar soils: 0 to 3 percent

#### **Major Component Description**

*Surface layer texture:* Silt loam

*Depth class:* Very deep (more than 60 inches)

*Drainage class:* Well drained

*Dominant parent material:* Eolian deposits

*Native plant cover type:* Rangeland

*Flooding:* None

*Sodium affected:* Sodic within 30 inches

*Available water capacity:* Mainly 10.3 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

#### **Management**

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

### **40--Dryfork-Selow complex, 0 to 4 percent slopes**

#### **Setting**

*Landform:*

\* Dryfork--Lake plains

\* Selow--Lake plains

*Slope:*

\* Dryfork--0 to 4 percent

\* Selow--0 to 4 percent

*Elevation:* 2,700 to 3,000 feet

*Mean annual precipitation:* 10 to 14 inches

*Frost-free period:* 105 to 120 days

#### **Composition**

##### **Major Components**

Dryfork and similar soils: 50 percent

Selow and similar soils: 35 percent

### Minor Components

Kerrdam and similar soils: 0 to 10 percent

Irvine and similar soils: 0 to 5 percent

### Major Component Description

#### Dryfork

*Surface layer texture:* Silt loam

*Depth class:* Very deep (more than 60 inches)

*Drainage class:* Well drained

*Dominant parent material:* Eolian deposits

*Native plant cover type:* Rangeland

*Flooding:* None

*Sodium affected:* Sodic within 30 inches

*Available water capacity:* Mainly 10.3 inches

#### Selow

*Surface layer texture:* Silty clay loam

*Depth class:* Very deep (more than 60 inches)

*Drainage class:* Well drained

*Dominant parent material:* Glaciolacustrine deposits

*Native plant cover type:* Rangeland

*Flooding:* None

*Sodium affected:* Sodic within 30 inches

*Available water capacity:* Mainly 9.4 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

### 41--Dryfork-Selow complex, 4 to 15 percent slopes

#### Setting

*Landform:*

- \* Dryfork--Lake plains
- \* Selow--Lake plains

*Slope:*

\* Dryfork--4 to 15 percent

\* Selow--4 to 15 percent

*Elevation:* 2,700 to 3,000 feet

*Mean annual precipitation:* 10 to 14 inches

*Frost-free period:* 105 to 120 days

### Composition

#### Major Components

Dryfork and similar soils: 50 percent

Selow and similar soils: 35 percent

#### Minor Components

Kerrdam and similar soils: 0 to 10 percent

Irvine and similar soils: 0 to 5 percent

### Major Component Description

#### Dryfork

*Surface layer texture:* Silt loam

*Depth class:* Very deep (more than 60 inches)

*Drainage class:* Well drained

*Dominant parent material:* Eolian deposits

*Native plant cover type:* Rangeland

*Flooding:* None

*Sodium affected:* Sodic within 30 inches

*Available water capacity:* Mainly 10.3 inches

#### Selow

*Surface layer texture:* Silty clay loam

*Depth class:* Very deep (more than 60 inches)

*Drainage class:* Well drained

*Dominant parent material:* Glaciolacustrine deposits

*Native plant cover type:* Rangeland

*Flooding:* None

*Sodium affected:* Sodic within 30 inches

*Available water capacity:* Mainly 9.5 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section

\* "Engineering" and "Soil Properties" sections

## Dubay Series

Dubay series consists of very deep, well drained soils on alluvial fans and stream terraces. These soils formed in glaciofluvial deposits. Slope is 0 to 6 percent. Elevation is 3,000 to 3,500 feet. The average annual precipitation is 16 to 22 inches, average annual air temperature is 40 to 45 degrees F, and the frost-free period is 105 to 120 days.

**Taxonomic Class:** Coarse-silty, mixed, frigid Typic Xerochrepts

### Typical Pedon

Dubay silt loam, 2 to 6 percent slopes, in an area of woodland; 1,000 feet south and 200 feet west of the northeast corner of sec. 18, T. 22 N., R. 19 W.

Oi--1 inch to 0; undecomposed needles and twigs.

A--0 to 5 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; slightly hard, very friable, nonsticky and nonplastic; many fine and medium roots; many fine and medium pores; neutral; clear irregular boundary.

E1--5 to 12 inches; pale brown (10YR 6/3) silt loam, brown (10YR 4/3) moist; weak coarse subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; many fine and medium roots; many fine and medium pores; neutral; gradual irregular boundary.

E2--12 to 30 inches; very pale brown (10YR 7/3) silt loam, brown (10YR 5/3) moist; weak coarse subangular blocky structure; hard, very friable, nonsticky and nonplastic; many fine roots; many fine pores; neutral; gradual irregular boundary.

E and Bw--30 to 60 inches; 70 percent is very pale brown (10YR 7/3) silt loam, pale brown (10YR 6/3) moist (E part); 30 percent is yellowish brown (10YR 5/4) very fine sandy loam, dark yellowish brown (10YR 4/4) moist (B part), lamellae 1/4 to 1/2 inch thick that total less than 3 inches thick; massive; slightly hard, very friable, nonsticky and nonplastic; common fine roots; common fine pores; neutral.

## Range in Characteristics

*Soil temperature:* 42 to 47 degrees F

*Moisture control section:* Between 4 and 12 inches; moist during December through March and dry during July, August, and early September

*Control section:* 5 to 15 percent clay and less than 15 percent fine sand or coarser and 0 to 10 percent pebbles

*Other features:* The dark colored surface of this soil does not meet thickness requirements for a mollic epipedon; some pedons have free lime below a depth of 40 inches

### A horizon

Value: 4 or 5 dry; 2 or 3 moist

Chroma: 1 or 2

Clay content: 10 to 18 percent

Content of rock fragments: 0 to 10 percent pebbles

Reaction: pH 6.1 to 7.3

### E1, E2 horizons

Value: 5, 6, or 7 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Silt loam or very fine sandy loam

Clay content: 5 to 15 percent

Content of rock fragments: 0 to 10 percent pebbles

Reaction: pH 6.1 to 7.3

### E and Bw horizon

Value: E part--6 or 7 dry and 4, 5, or 6 moist; B part--5 or 6 dry and 4 or 5 moist

Chroma: E part--2 or 3, B part--2, 3, or 4

Texture: Silt loam or very fine sandy loam

Clay content: 5 to 15 percent

Content of rock fragments: 0 to 10 percent pebbles

Reaction: pH 6.6 to 7.8

## 42--Dubay silt loam, 0 to 2 percent slopes

### Setting

*Landform:* Alluvial fans and stream terraces

*Slope:* 0 to 2 percent

*Elevation:* 3,000 to 3,500 feet

*Mean annual precipitation:* 16 to 22 inches

*Frost-free period:* 105 to 120 days

### Composition

#### Major Components

Dubay and similar soils: 90 percent

### Minor Components

Gird and similar soils: 0 to 5 percent  
Dubay, silty clay loam subsoil: 0 to 5 percent

### Major Component Description

*Surface layer texture:* Silt loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Glaciofluvial deposits  
*Native plant cover type:* Forest land  
*Flooding:* None  
*Available water capacity:* Mainly 11.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Forest Land" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

### 43--Dubay silt loam, 2 to 6 percent slopes

#### Setting

*Landform:* Alluvial fans and stream terraces  
*Slope:* 2 to 6 percent  
*Elevation:* 3,000 to 3,500 feet  
*Mean annual precipitation:* 16 to 22 inches  
*Frost-free period:* 105 to 120 days

#### Composition

##### Major Components

Dubay and similar soils: 90 percent

##### Minor Components

Gird and similar soils: 0 to 5 percent  
Selon and similar soils: 0 to 5 percent

### Major Component Description

*Surface layer texture:* Silt loam

*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Glaciofluvial deposits  
*Native plant cover type:* Forest land  
*Flooding:* None  
*Available water capacity:* Mainly 11.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Forest Land" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

### 44--Eaglewing gravelly silt loam, 8 to 15 percent slopes

#### Setting

*Landform:* Moraines  
*Slope:* 8 to 15 percent  
*Elevation:* 2,900 to 4,500 feet  
*Mean annual precipitation:* 18 to 24 inches  
*Frost-free period:* 90 to 105 days

#### Composition

##### Major Components

Eaglewing and similar soils: 85 percent

##### Minor Components

Kingspoint and similar soils: 0 to 5 percent  
Half Moon and similar soils: 0 to 5 percent  
Somewhat poorly drained soils: 0 to 2 percent  
Eaglewing, stony or bouldery: 0 to 1 percent  
Poorly drained soils: 0 to 2 percent

### Major Component Description

*Surface layer texture:* Gravelly silt loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Alpine till

*Native plant cover type:* Forest land  
*Flooding:* None  
*Available water capacity:* Mainly 8.7 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Forest Land" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## 45--Eaglewing gravelly silt loam, 15 to 30 percent slopes

### Setting

*Landform:* Moraines  
*Slope:* 15 to 30 percent  
*Elevation:* 2,900 to 4,500 feet  
*Mean annual precipitation:* 18 to 24 inches  
*Frost-free period:* 90 to 105 days

### Composition

#### Major Components

Eaglewing and similar soils: 85 percent

#### Minor Components

Kingspoint and similar soils: 0 to 7 percent  
Eaglewing, stony or bouldery: 0 to 2 percent  
Half Moon and similar soils: 0 to 6 percent

### Major Component Description

*Surface layer texture:* Gravelly silt loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Alpine till  
*Native plant cover type:* Forest land  
*Flooding:* None  
*Available water capacity:* Mainly 5.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Forest Land" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

### Eaglewing Series

Eaglewing series consists of very deep, well drained soils on moraines. These soils formed in alpine till. Slope is 2 to 30 percent. Elevation is 2,900 to 4,500 feet. The average annual precipitation is 18 to 24 inches, average annual air temperature is 40 to 45 degrees F, and the frost-free period is 90 to 105 days.

**Taxonomic Class:** Fine-loamy, mixed, frigid Typic Ustochrepts

### Typical Pedon

Eaglewing gravelly silt loam, 15 to 30 percent slopes, in an area of woodland; 1,000 feet south and 1,700 feet west of the northeast corner of sec. 8, T. 25 N., R. 20 W.

- O--1 inch to 0; undecomposed needles and twigs.  
E--0 to 11 inches; light brownish gray (10YR 6/2) gravelly silt loam, dark grayish brown (10YR 4/2) moist; moderate medium and coarse granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots and common medium roots; 20 percent pebbles; neutral; clear smooth boundary.  
Bw--11 to 20 inches; pale brown (10YR 6/3) gravelly silt loam, dark brown (10YR 4/3) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine and fine roots and common medium roots; common fine

pores; 25 percent pebbles; neutral; abrupt wavy boundary.

Bk1--20 to 27 inches; white (10YR 8/2) gravelly silt loam, light brownish gray (10YR 6/2) moist; moderate fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine roots and few medium roots; common fine pores and few medium pores; 25 percent pebbles; disseminated lime; violently effervescent; moderately alkaline; clear wavy boundary.

Bk2--27 to 36 inches; white (10YR 8/2) gravelly silt loam, pale brown (10YR 6/3) moist; massive; soft, friable, slightly sticky and slightly plastic; common very fine and fine roots and few medium roots; few fine and medium pores; 20 percent hard pebbles and 10 percent soft weathered pebbles; disseminated lime; violently effervescent; moderately alkaline; gradual wavy boundary.

Bk3--36 to 60 inches; white (10YR 8/2) silt loam, light gray (10YR 7/2) moist; massive; soft, friable, slightly sticky and slightly plastic; common very fine roots and few fine roots; 10 percent hard pebbles and 15 percent soft weathered pebbles; disseminated lime; violently effervescent; moderately alkaline.

### Range in Characteristics

*Soil temperature:* 42 to 47 degrees F

*Moisture control section:* Between 4 and 12 inches; moist in all parts May through June

*Control section:* 18 to 27 percent clay and 5 to 35 percent rock fragments

*Depth to calcic horizon:* 13 to 28 inches

*Other features:* Some pedons have an E/Bw horizon 3 to 9 inches thick

#### *E horizon*

Value: 6 or 7 dry; 4, 5, or 6 moist

Chroma: 2 or 3

Clay content: 18 to 27 percent

Content of rock fragments: 5 to 35 percent--0 to 10 percent cobbles and stones, 5 to 25 percent pebbles

Reaction: pH 6.6 to 7.3

#### *Bw horizon*

Hue: 10YR or 2.5Y

Value: 6 or 7 dry; 4 or 5 moist

Chroma: 3 or 4

Texture: Silt loam or loam

Clay content: 18 to 27 percent

Content of rock fragments: 5 to 35 percent--0 to 10 percent cobbles and stones, 5 to 25 percent pebbles

Reaction: pH 6.6 to 7.3

#### *Bk1 horizon*

Hue: 10YR or 2.5Y

Value: 7 or 8 dry; 5, 6, or 7 moist

Chroma: 2 or 3

Texture: Silt loam or loam

Clay content: 18 to 27 percent

Content of rock fragments: 5 to 35 percent--0 to 10 percent cobbles and stones, 5 to 25 percent pebbles

Calcium carbonate equivalent: 20 to 40 percent

Reaction: pH 7.9 to 8.4

#### *Bk2, Bk3 horizons*

Hue: 10YR or 2.5Y

Value: 6, 7, or 8 dry; 5, 6, or 7 moist

Chroma: 2 or 3

Texture: Silt loam or loam

Clay content: 18 to 27 percent

Content of rock fragments: 5 to 45 percent--0 to 15 percent cobbles and stones, 5 to 40 percent pebbles, 0 to 15 percent soft fragments

Calcium carbonate equivalent: 20 to 40 percent

Reaction: pH 7.9 to 8.4

## 46--Eaglewing silt loam, 2 to 8 percent slopes

### Setting

*Landform:* Moraines

*Slope:* 2 to 8 percent

*Elevation:* 2,900 to 4,500 feet

*Mean annual precipitation:* 18 to 24 inches

*Frost-free period:* 90 to 105 days

### Composition

#### Major Components

Eaglewing and similar soils: 85 percent

#### Minor Components

Kingspoint and similar soils: 0 to 5 percent

Half Moon and similar soils: 0 to 5 percent

Somewhat poorly drained soils: 0 to 2 percent

Dayton area-sodic soils: 0 to 1 percent

Poorly drained soils: 0 to 2 percent

### Major Component Description

*Surface layer texture:* Silt loam

*Depth class:* Very deep (more than 60 inches)

*Drainage class:* Well drained

*Dominant parent material:* Alpine till

*Native plant cover type:* Forest land  
*Flooding:* None  
*Available water capacity:* Mainly 9.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Forest Land" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

### Esteslake Series

Esteslake series consists of very deep, well drained, sodium-affected soils on dissected lake plains, dissected alluvial fans, and stream terraces. These soils formed in varved, clayey, glaciolacustrine deposits. Slope is 0 to 4 percent. Elevation is 2,600 to 3,000 feet. The average annual precipitation is 10 to 14 inches, average annual air temperature is 41 to 45 degrees F, and the frost-free period is 105 to 120 days.

**Taxonomic Class:** Fine, illitic, frigid Typic Natrixeralfs

### Typical Pedon

Esteslake silty clay loam in an area of Esteslake-Slickspots complex, 0 to 4 percent slopes, in rangeland; 2,300 feet south and 1,200 feet east of the northwest corner of sec. 11, T. 22 N., R. 22 W.

E--0 to 3 inches; light gray (10YR 7/2) silty clay loam, grayish brown (10YR 5/2) moist; moderate coarse platy structure parting to strong coarse granular; hard, friable, slightly sticky and slightly plastic; common very fine and fine roots; common very fine, fine, and medium pores; slightly effervescent; strongly alkaline; abrupt wavy boundary.

Btn1--3 to 7 inches; very pale brown (10YR 7/3) silty clay, pale brown (10YR 6/3) moist; weak coarse prismatic structure parting to strong fine angular blocky; hard, firm, very sticky and very plastic; common very fine and fine roots; common very fine, fine, and medium pores; common faint clay films on faces of peds; disseminated lime; strongly effervescent; strongly alkaline; abrupt wavy boundary.

Btn2--7 to 12 inches; very pale brown (10YR 7/3) silty clay loam, pale brown (10YR 6/3) moist; weak coarse prismatic structure parting to moderate medium subangular blocky; slightly hard, friable, very sticky and very plastic; common very fine and fine roots; many very fine and fine pores and common medium pores; common faint clay films on faces of peds; disseminated lime; strongly effervescent; very strongly alkaline; clear wavy boundary.

Btkn--12 to 19 inches; white (10YR 8/2) silty clay loam, very pale brown (10YR 7/3) moist; massive; slightly hard, friable, sticky and plastic; few very fine and fine roots; few fine, very fine, and medium pores; common faint clay films lining pores and common faint clay bridging of sand grains; disseminated lime and few fine masses of lime; violently effervescent; very strongly alkaline; gradual wavy boundary.

C1--19 to 41 inches; white (10YR 8/2) silty clay loam that has strata of silty clay, very pale brown (10YR 7/3) moist; moderate medium platy structure; slightly hard, friable, sticky and plastic; few fine roots; disseminated lime; strongly effervescent; very strongly alkaline; abrupt smooth boundary.

C2--41 to 60 inches; very pale brown (10YR 7/3) silty clay loam that has strata of silty clay, light yellowish brown (10YR 6/4) moist; massive breaking to plates 1 inch thick; hard, firm, very sticky and very plastic; disseminated lime; strongly effervescent; very strongly alkaline.

### Range in Characteristics

*Soil temperature:* 43 to 47 degrees F

*Moisture control section:* Between 4 to 12 inches

*Content of clay in the control section:* 35 to 50 percent

*Other features:* Some pedons have a dark gray (10YR 4/1) dry horizon at a depth of 2 to 4 inches and is 2 to 4 inches thick

#### *E horizon*

Value: 7 or 8 dry; 5 or 6 moist

Chroma: 2 or 3

Texture: Silty clay loam or silt loam

Clay content: 18 to 35 percent  
Electrical conductivity: 0 to 4 mmhos/cm  
Sodium adsorption ratio: 20 to 45  
Reaction: pH 8.5 to 9.0

*Btn horizons*

Value: 7 or 8 dry; 4, 5, or 6 moist  
Chroma: 2 or 3  
Texture: Silty clay loam or silty clay  
Clay content: 35 to 50 percent  
Electrical conductivity: 8 to 12 mmhos/cm  
Sodium adsorption ratio: 45 to 275  
Reaction: Greater than pH 9.0

*Btkn horizon*

Value: 7 or 8 dry; 6 or 7 moist  
Chroma: 2 or 3  
Texture: Silty clay loam or silty clay  
Clay content: 35 to 50 percent  
Calcium carbonate equivalent: 10 to 15 percent  
Electrical conductivity: 8 to 12 mmhos/cm  
Sodium adsorption ratio: 45 to 275  
Reaction: Greater than pH 9.0

*C1, C2 horizons*

Value: 7 or 8 dry; 5, 6, or 7 moist  
Chroma: 2, 3, or 4  
Texture: Silty clay loam or silty clay  
Clay content: 35 to 50 percent  
Electrical conductivity: 0 to 4 mmhos/cm  
Sodium adsorption ratio: 30 to 100  
Reaction: Greater than pH 9.0

## 47--Esteslake-Slickspots complex, 0 to 4 percent slopes

### Setting

*Landform:*

- \* Esteslake--Lake plains
- \* Slickspots--Lake plains

*Slope:*

- \* Esteslake--0 to 4 percent
- \* Slickspots--0 to 2 percent

*Elevation:* 2,600 to 3,000 feet

*Mean annual precipitation:* 12 to 14 inches

*Frost-free period:* 105 to 120 days

### Composition

#### Major Components

Esteslake and similar soils: 55 percent

Slickspots: 30 percent

#### Minor Components

Round Butte and similar soils: 0 to 12 percent

Areas of badland: 0 to 3 percent

## Major Component Description

### Esteslake

*Surface layer texture:* Silty clay loam

*Depth class:* Very deep (more than 60 inches)

*Drainage class:* Well drained

*Dominant parent material:* Glaciolacustrine deposits

*Native plant cover type:* Rangeland

*Flooding:* None

*Salt affected:* Saline within 30 inches

*Sodium affected:* Sodic within 30 inches

*Available water capacity:* Mainly 4.3 inches

### Slickspots

*Definition:* A small area of soil having a puddled, crusted or smooth surface and an excess of exchangeable sodium. The soil is slippery when wet and very low in productivity.

*Dominant parent material:* Glaciolacustrine deposits

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

## Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## Felan Series

Felan series consists of very deep, well drained soils that formed in colluvium derived from limestone or argillite. The surface layer has a large component of volcanic ash. These soils are on mountain slopes. Slope is 15 to 60 percent. Elevation is 4,000 to 6,200 feet. The average annual precipitation is 30 to 60 inches, average annual air temperature is 37 to 42 degrees F, and the frost-free period is 30 to 60 days.

**Taxonomic Class:** Loamy-skeletal, mixed Andic Cryoboralfs

## Typical Pedon

Felan gravelly silt loam, 30 to 60 percent slopes, in an area of woodland; 1,400 feet west and 200 feet south of the northeast corner of sec. 17, T. 17 N., R. 19 W.

Oi--2 inches to 0; undecomposed and slightly decomposed forest litter.

Bs--0 to 7 inches; light yellowish brown (10YR 6/4) gravelly silt loam, dark yellowish brown (10YR 4/4) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; many fine and medium roots; 25 percent pebbles and 5 percent cobbles; medium acid; abrupt wavy boundary.

2E--7 to 23 inches; light brownish gray (2.5Y 6/2) very gravelly loam, dark grayish brown (2.5Y 5/2) moist; weak fine granular structure; soft, very friable, slightly sticky and slightly plastic; many fine and medium roots; 45 percent pebbles and 10 percent cobbles; neutral; clear wavy boundary.

2BE--23 to 38 inches; pale brown (10YR 6/3) very gravelly loam, brown (10YR 5/3) moist; moderate medium subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; common very fine, fine, and medium roots and few coarse roots; 40 percent pebbles and 10 percent cobbles; neutral; clear wavy boundary.

2Bt--38 to 60 inches; light olive brown (2.5Y 5/4) very gravelly loam, olive brown (2.5Y 4/4) moist; moderate medium subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; common very fine, fine, and medium roots and few coarse roots; common faint clay bridging and coatings on sand grains; 50 percent pebbles and 10 percent cobbles; neutral.

## Range in Characteristics

*Soil temperature:* 39 to 44 degrees F

*Moisture control section:* Between 8 and 24 inches

*Control section:* 8 to 18 percent clay and 40 to 60 percent silt, less than 45 percent total sand (less than 35 percent sand coarser than very fine sand)

*Depth to carbonates:* Commonly below 60 inches but as shallow as 40 inches in some pedons

### *Bs horizon*

Hue: 10YR or 7.5YR

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 4 or 6

Clay content: 5 to 15 percent

Content of rock fragments: 15 to 35 percent--0 to 5 percent angular cobbles and stones, 15 to 30 percent angular pebbles

Moist bulk density: 1.0 g/cc or less

Reaction: pH 5.1 to 6.5

### *2E horizon*

Hue: 2.5Y or 10YR

Value: 6 or 7 dry; 5 or 6 moist

Chroma: 2 or 3

Texture: Silt loam or loam

Clay content: 5 to 15 percent

Content of rock fragments: 35 to 70 percent--0 to 10 percent angular cobbles and stones, 35 to 60 percent angular pebbles

Reaction: pH 5.1 to 7.3

### *2Bt horizon*

Hue: 2.5Y or 10YR

Value: 5, 6, or 7 dry; 4 or 5 moist

Chroma: 3, 4, 5, or 6

Texture: Loam or silt loam

Clay content: 8 to 18 percent

Content of rock fragments: 40 to 75 percent--0 to 10 percent angular cobbles and stones, 40 to 65 percent angular pebbles

Reaction: pH 6.6 to 8.4

## 48--Felan gravelly silt loam, 15 to 30 percent slopes

### Setting

*Landform:* Mountains

*Slope:* 15 to 30 percent

*Elevation:* 4,000 to 6,200 feet

*Mean annual precipitation:* 30 to 60 inches

*Frost-free period:* 30 to 60 days

### Composition

#### Major Components

Felan and similar soils: 85 percent

#### Minor Components

Holloway and similar soils: 0 to 12 percent

Areas of rock outcrop: 0 to 3 percent

### Major Component Description

*Surface layer texture:* Gravelly silt loam

*Depth class:* Very deep (more than 60 inches)

*Drainage class:* Well drained

*Dominant parent material:* Colluvium

*Native plant cover type:* Forest land

*Flooding:* None

*Available water capacity:* Mainly 6.5 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Forest Land" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## 49--Felan gravelly silt loam, 30 to 60 percent slopes

### Setting

*Landform:* Mountains

*Slope:* 30 to 60 percent

*Elevation:* 4,000 to 6,200 feet

*Mean annual precipitation:* 30 to 60 inches

*Frost-free period:* 30 to 60 days

### Composition

#### Major Components

Felan and similar soils: 85 percent

#### Minor Components

Holloway and similar soils: 0 to 6 percent

Mollman soils on warmer aspects: 0 to 6 percent

Areas of rock outcrop: 0 to 3 percent

### Major Component Description

*Surface layer texture:* Gravelly silt loam

*Depth class:* Very deep (more than 60 inches)

*Drainage class:* Well drained

*Dominant parent material:* Colluvium

*Native plant cover type:* Forest land

*Flooding:* None

*Available water capacity:* Mainly 6.4 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this

map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Forest Land" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## Finleypoint Series

Finleypoint series consists of very deep, well drained soils on moraines and mountains. These soils formed in alpine till and colluvium. Slope is 2 to 60 percent. Elevation is 2,900 to 6,000 feet. The average annual precipitation is 15 to 24 inches, average annual air temperature is 41 to 45 degrees F, and the frost-free period is 75 to 120 days.

**Taxonomic Class:** Loamy-skeletal, mixed Udic Haploborolls

### Typical Pedon

Finleypoint cobbly loam, 2 to 8 percent slopes, in an area of woodland; approximately 2,200 feet north and 2,500 feet east of the southwest corner of sec. 12, T. 23 N., R. 21 W.

Oi--1 inch to 0; undecomposed needles and twigs.  
A1--0 to 9 inches; dark grayish brown (10YR 4/2) cobbly loam, black (10YR 2/1) moist; weak moderate and fine granular structure; soft, very friable, slightly sticky and slightly plastic; many fine and medium roots; 10 percent subrounded pebbles and 10 percent subrounded cobbles; slightly acid; clear wavy boundary.

A2--9 to 13 inches; brown (10YR 5/3) very cobbly loam, very dark brown (10YR 3/2) moist; moderate medium subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; many fine and medium roots; 30 percent subangular pebbles and 25 percent subangular cobbles; slightly acid; clear wavy boundary.

E--13 to 30 inches; white (10YR 8/1) very gravelly loam, light brownish gray (10YR 6/2)

moist; weak coarse subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common fine and medium roots; 30 percent subangular pebbles and 10 percent subangular cobbles; neutral; gradual irregular boundary.

E/Bw--30 to 42 inches; 55 percent light gray (10YR 7/2) and grayish brown (10YR 5/2) moist (E part), very gravelly sandy clay loam; 45 percent yellowish brown (10YR 5/4) very gravelly sandy clay loam, dark yellowish brown (10YR 4/4) moist (B part); weak coarse and moderate medium angular blocky structure; hard, very friable, slightly sticky and slightly plastic; few fine and medium roots; 30 percent subangular pebbles and 15 percent subangular cobbles; neutral; gradual irregular boundary.

C--42 to 60 inches; light gray (10YR 7/2) very gravelly loam, grayish brown (10YR 5/2) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; 40 percent subangular pebbles and 10 percent subangular cobbles; neutral.

### Range in Characteristics

*Soil temperature:* 43 to 47 degrees F

*Moisture control section:* Between 4 and 24 inches

*Mollic epipedon thickness:* 10 to 16 inches

*Control section:* 10 to 25 percent clay and 35 to 60 percent rock fragments

#### A1 horizon

Value: 3 or 4 dry; 2 or 3 moist

Chroma: 2 dry, 1 moist

Clay content: 15 to 25 percent

Content of rock fragments: 15 to 55 percent--5 to 20 percent stones and cobbles, 5 to 45 percent pebbles

Reaction: pH 6.1 to 7.3

#### A2 horizon

Value: 3, 4, or 5 dry; 2 or 3 moist

Chroma: 2 or 3

Clay content: 15 to 25 percent

Content of rock fragments: 20 to 60 percent--10 to 30 percent stones and cobbles, 10 to 30 percent pebbles

Reaction: pH 6.1 to 7.3

#### E horizon

Value: 6, 7, or 8 dry; 4, 5, or 6 moist

Chroma: 1, 2, or 3

Texture: Loam or sandy loam

Clay content: 15 to 25 percent

Content of rock fragments: 35 to 60 percent--10 to 20 percent cobbles and stones, 25 to 40 percent pebbles

Reaction: pH 6.1 to 7.3

#### E/Bw horizon

Hue: E part--10YR or 2.5Y, B part--10YR or 2.5Y

Value: E part--6, 7, or 8 dry and 5 or 6 moist; B part--5, 6, or 7 dry and 4 or 5 moist

Chroma: E part--1, 2, or 3; B part--3 or 4

Texture: Loam, sandy loam, or sandy clay loam

Clay content: 10 to 25 percent

Content of rock fragments: 35 to 60 percent--15 to 30 percent cobbles and stones, 20 to 30 percent pebbles

Reaction: pH 6.1 to 7.3

Other features: Some pedons have a Bw/E horizon instead of an E/Bw horizon

#### C horizon

Hue: 10YR or 2.5Y

Value: 6, 7, or 8 dry; 5 or 6 moist

Chroma: 1 or 2

Texture: Loam, sandy loam, or sandy clay loam

Clay content: 15 to 25 percent

Content of rock fragments: 35 to 60 percent--5 to 20 percent cobbles and stones, 30 to 40 percent pebbles

Reaction: pH 6.1 to 7.3

## 50--Finleypoint cobbly loam, 2 to 8 percent slopes

### Setting

*Landform:* Moraines

*Slope:* 2 to 8 percent

*Elevation:* 2,900 to 4,000 feet

*Mean annual precipitation:* 20 to 24 inches

*Frost-free period:* 90 to 105 days

### Composition

#### Major Components

Finleypoint and similar soils: 85 percent

#### Minor Components

Wildgen and similar soils: 0 to 5 percent

Finleypoint very stony loam: 0 to 5 percent

Somewhat poorly drained soils: 0 to 1 percent

Poorly drained soils: 0 to 2 percent

### Major Component Description

*Surface layer texture:* Cobbly loam

*Depth class:* Very deep (more than 60 inches)

*Drainage class:* Well drained

*Dominant parent material:* Alpine till  
*Native plant cover type:* Forest land  
*Flooding:* None  
*Available water capacity:* Mainly 6.0 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Forest Land" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

### 51--Finleypoint cobbly loam, 8 to 15 percent slopes

#### Setting

*Landform:* Moraines  
*Slope:* 8 to 15 percent  
*Elevation:* 2,900 to 4,000 feet  
*Mean annual precipitation:* 20 to 24 inches  
*Frost-free period:* 75 to 105 days

#### Composition

##### Major Components

Finleypoint and similar soils: 90 percent

##### Minor Components

Wildgen and similar soils: 0 to 5 percent  
Finleypoint very stony loam: 0 to 5 percent

#### Major Component Description

*Surface layer texture:* Cobbly loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Alpine till  
*Native plant cover type:* Forest land  
*Flooding:* None  
*Available water capacity:* Mainly 6.0 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Forest Land" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

### 52--Finleypoint gravelly loam, 15 to 30 percent slopes

#### Setting

*Landform:* Mountains  
*Slope:* 15 to 30 percent  
*Elevation:* 2,900 to 5,000 feet  
*Mean annual precipitation:* 20 to 24 inches  
*Frost-free period:* 75 to 105 days

#### Composition

##### Major Components

Finleypoint and similar soils: 85 percent

##### Minor Components

Bigarm and similar soils: 0 to 5 percent  
Finleypoint, dry soils: 0 to 5 percent  
Widgen and similar soils: 0 to 5 percent

#### Major Component Description

*Surface layer texture:* Gravelly loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Alpine till  
*Native plant cover type:* Forest land  
*Flooding:* None  
*Available water capacity:* Mainly 5.9 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is

available in the "Soil Properties" section, Part II, of this publication.

### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Forest Land" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

### 53--Finleypoint gravelly loam, 30 to 60 percent slopes

#### Setting

*Landform:* Mountains  
*Slope:* 30 to 60 percent  
*Elevation:* 2,900 to 5,000 feet  
*Mean annual precipitation:* 20 to 24 inches  
*Frost-free period:* 75 to 105 days

#### Composition

##### Major Components

Finleypoint and similar soils: 85 percent

##### Minor Components

Bigarm and similar soils: 0 to 5 percent  
Finleypoint, dry soils: 0 to 5 percent  
Widgen and similar soils: 0 to 2 percent  
Hogsby and similar soils: 0 to 2 percent  
Areas of rock outcrop: 0 to 1 percent

#### Major Component Description

*Surface layer texture:* Gravelly loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Alpine till  
*Native plant cover type:* Forest land  
*Flooding:* None  
*Available water capacity:* Mainly 5.9 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Forest Land" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

### 54--Finleypoint gravelly loam, dry, 15 to 30 percent slopes

#### Setting

*Landform:* Mountains  
*Slope:* 15 to 30 percent  
*Elevation:* 3,200 to 5,000 feet  
*Mean annual precipitation:* 16 to 20 inches  
*Frost-free period:* 75 to 105 days

#### Composition

##### Major Components

Finleypoint and similar soils: 85 percent

##### Minor Components

Bigarm and similar soils: 0 to 10 percent  
Widgen and similar soils: 0 to 5 percent

#### Major Component Description

*Surface layer texture:* Gravelly loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Alpine till  
*Native plant cover type:* Forest land  
*Flooding:* None  
*Available water capacity:* Mainly 5.9 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Forest Land" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

**55--Finleypoint very gravelly loam, dry, 30 to 60 percent slopes**

**Setting**

*Landform:* Mountains  
*Slope:* 30 to 60 percent  
*Elevation:* 2,900 to 5,000 feet  
*Mean annual precipitation:* 16 to 20 inches  
*Frost-free period:* 75 to 105 days

**Composition**

**Major Components**

Finleypoint and similar soils: 85 percent

**Minor Components**

Winkler and similar soils: 0 to 5 percent  
 Bigarm and similar soils: 0 to 5 percent  
 Wildgen and similar soils: 0 to 5 percent

**Major Component Description**

*Surface layer texture:* Gravelly loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Alpine till  
*Native plant cover type:* Forest land  
*Flooding:* None  
*Available water capacity:* Mainly 5.9 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

**Management**

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Forest Land" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section

- \* "Engineering" and "Soil Properties" sections

**56--Finleypoint-Wildgen gravelly loams, 30 to 60 percent slopes**

**Setting**

*Landform:*  
 \* Finleypoint--Mountains  
 \* Wildgen--Mountains  
*Slope:*  
 \* Finleypoint--30 to 60 percent  
 \* Wildgen--30 to 60 percent  
*Elevation:* 3,400 to 5,000 feet  
*Mean annual precipitation:* 20 to 24 inches  
*Frost-free period:* 90 to 105 days

**Composition**

**Major Components**

Finleypoint and similar soils: 45 percent  
 Wildgen and similar soils: 40 percent

**Minor Components**

Bigarm and similar soils: 0 to 4 percent  
 Hogsby and similar soils: 0 to 4 percent  
 Finleypoint, dry soils: 0 to 3 percent  
 Mitten, dry soils: 0 to 2 percent  
 Areas of rock outcrop: 0 to 2 percent

**Major Component Description**

**Finleypoint**

*Surface layer texture:* Gravelly loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Alpine till  
*Native plant cover type:* Forest land  
*Flooding:* None  
*Available water capacity:* Mainly 5.8 inches

**Wildgen**

*Surface layer texture:* Gravelly loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Alpine till  
*Native plant cover type:* Forest land  
*Flooding:* None  
*Available water capacity:* Mainly 5.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

## Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Forest Land" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## Flott Series

Flott series consists of very deep, well drained soils on moraines and mountains. These soils formed in alpine till derived from limestone or calcareous argillite. Slope is 2 to 60 percent. Elevation is 2,900 to 4,000 feet. The average annual precipitation is 18 to 22 inches, average annual air temperature is 40 to 44 degrees F, and the frost-free period is 90 to 105 days.

**Taxonomic Class:** Loamy-skeletal, mixed, Udic Haploborolls

### Typical Pedon

Flott gravelly loam, 15 to 30 percent slopes, in an area of woodland; approximately 800 feet south and 1,800 feet east of the northwest corner of sec. 6, T. 17 N., R. 19 W.

- Oe--2 inches to 0; intermediately decomposed needles and twigs.
- A1--0 to 8 inches; dark grayish brown (10YR 4/2) gravelly loam, very dark gray (10YR 3/1) moist; moderate medium granular structure; soft, very friable, slightly sticky and slightly plastic; many fine and medium roots; many very fine interstitial pores; 5 percent cobbles and 20 percent pebbles; slightly acid; clear wavy boundary.
- A2--8 to 10 inches; dark grayish brown (10YR 4/2) gravelly loam, very dark grayish brown (10YR 3/2) moist; moderate medium granular structure; soft, very friable, slightly sticky and slightly plastic; many fine and medium roots; many very fine interstitial pores; 5 percent cobbles and 20 percent pebbles; slightly acid; abrupt wavy boundary.
- E--10 to 18 inches; brown (10YR 5/3) very gravelly loam, dark yellowish brown (10YR 4/4) moist; weak medium subangular blocky

structure; soft, very friable, slightly sticky and slightly plastic; many fine roots and common medium and coarse roots; common fine interstitial pores; 5 percent cobbles and 50 percent pebbles; slightly acid; clear wavy boundary.

- E/Bw--18 to 23 inches; 55 percent brown (10YR 5/3) very gravelly loam, dark yellowish brown (10YR 4/4) moist (E part); 45 percent light olive brown (2.5Y 5/4) very gravelly loam, olive brown (2.5Y 4/4) moist (B part); weak medium subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; many fine roots and common medium and coarse roots; common fine interstitial pores; 10 percent cobbles and 45 percent pebbles; neutral; clear wavy boundary.
- Bk1--23 to 44 inches; white (2.5Y 8/2) very gravelly loam, light yellowish brown (2.5Y 6/4) moist; massive; soft, very friable, slightly sticky and slightly plastic; few fine roots; 10 percent cobbles and 45 percent pebbles; disseminated lime; violently effervescent; moderately alkaline; gradual smooth boundary.
- Bk2--44 to 60 inches; pale yellow (2.5Y 7/4) very gravelly loam, light olive brown (2.5Y 5/4) moist; massive; soft, very friable, slightly sticky and slightly plastic; 10 percent cobbles and 45 percent pebbles; disseminated lime; violently effervescent; moderately alkaline.

### Range in Characteristics

*Soil temperature:* 42 to 47 degrees F

*Moisture control section:* Between 4 and 12 inches

*Mollic epipedon thickness:* 8 to 16 inches

*Control section:* 18 to 30 percent clay and 35 to 60 percent rock fragments

*Depth to k horizon:* 15 to 30 inches

#### *A1 horizon*

Value: 3, 4, or 5 dry; 2 or 3 moist

Chroma: 2 dry, 1 moist

Clay content: 10 to 27 percent

Content of rock fragments: 15 to 60 percent--0 to 15 percent cobbles and stones, 15 to 45 percent pebbles

Reaction: pH 6.1 to 7.3

#### *E horizon*

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2, 3, or 4

Texture: Loam or silt loam

Clay content: 10 to 27 percent

Content of rock fragments: 35 to 60 percent--0 to 15 percent cobbles and stones, 35 to 45 percent pebbles

Reaction: pH 6.1 to 7.3

*E/Bw horizon*

Hue: B part--10YR or 2.5Y; E part--10YR or 2.5Y

Value: E part--5 or 6 dry and 4 or 5 moist; B part--4 or 5 dry and 4 or 5 moist

Chroma: E part--3 or 4,;B part--4 or 6

Texture: Loam, silt loam, or clay loam

Clay content: 18 to 30 percent

Content of rock fragments: 35 to 60 percent--0 to 15 percent cobbles and stones, 35 to 45 percent pebbles

Reaction: pH 6.6 to 7.8

Other features: Some pedons have a B/E horizon instead of an E/B horizon

*Bk horizons*

Hue: 10YR or 2.5Y

Value: 6, 7, or 8 dry; 4, 5, or 6 moist

Chroma: 2, 3, or 4

Texture: Loam, silt loam, or clay loam

Clay content: 18 to 30 percent

Content of rock fragments: 35 to 60 percent--0 to 15 percent cobbles and stones, 35 to 45 percent pebbles

Calcium carbonate equivalent: 15 to 40 percent

Reaction: pH 7.9 to 8.4

**57--Flott gravelly loam, 2 to 8 percent slopes**

**Setting**

*Landform:* Moraines

*Slope:* 2 to 8 percent

*Elevation:* 2,900 to 4,000 feet

*Mean annual precipitation:* 19 to 22 inches

*Frost-free period:* 90 to 105 days

**Composition**

**Major Components**

Flott and similar soils: 85 percent

**Minor Components**

Finleypoint and similar soils: 0 to 5 percent

Kingspoint and similar soils: 0 to 5 percent

Wildgen and similar soils: 0 to 5 percent

**Major Component Description**

*Surface layer texture:* Gravelly loam

*Depth class:* Very deep (more than 60 inches)

*Drainage class:* Well drained

*Dominant parent material:* Alpine till

*Native plant cover type:* Forest land

*Flooding:* None

*Available water capacity:* Mainly 6.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

**Management**

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Forest Land" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

**58--Flott gravelly loam, 8 to 15 percent slopes**

**Setting**

*Landform:* Moraines

*Slope:* 8 to 15 percent

*Elevation:* 2,900 to 4,000 feet

*Mean annual precipitation:* 19 to 22 inches

*Frost-free period:* 90 to 105 days

**Composition**

**Major Components**

Flott and similar soils: 85 percent

**Minor Components**

Finleypoint and similar soils: 0 to 5 percent

Kingspoint and similar soils: 0 to 5 percent

Wildgen and similar soils: 0 to 5 percent

**Major Component Description**

*Surface layer texture:* Gravelly loam

*Depth class:* Very deep (more than 60 inches)

*Drainage class:* Well drained

*Dominant parent material:* Alpine till

*Native plant cover type:* Forest land

*Flooding:* None

*Available water capacity:* Mainly 6.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Forest Land" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

### 59--Flott gravelly loam, 15 to 30 percent slopes

#### Setting

*Landform:* Moraines  
*Slope:* 15 to 30 percent  
*Elevation:* 2,900 to 4,000 feet  
*Mean annual precipitation:* 19 to 22 inches  
*Frost-free period:* 90 to 105 days

#### Composition

##### Major Components

Flott and similar soils: 85 percent

##### Minor Components

Finleypoint and similar soils: 0 to 5 percent  
Kingspoint and similar soils: 0 to 5 percent  
Wildgen and similar soils: 0 to 5 percent

#### Major Component Description

*Surface layer texture:* Gravelly loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Alpine till  
*Native plant cover type:* Forest land  
*Flooding:* None  
*Available water capacity:* Mainly 6.0 inches

A typical soil description with range in characteristics is included, in alphabetical order, in

this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Forest Land" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

### 60--Flott gravelly loam, 30 to 60 percent slopes

#### Setting

*Landform:* Mountains  
*Slope:* 30 to 60 percent  
*Elevation:* 2,900 to 4,000 feet  
*Mean annual precipitation:* 19 to 22 inches  
*Frost-free period:* 90 to 105 days

#### Composition

##### Major Components

Flott and similar soils: 90 percent

##### Minor Components

Kingspoint and similar soils: 0 to 8 percent  
Areas of rock outcrop: 0 to 2 percent

#### Major Component Description

*Surface layer texture:* Gravelly loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Alpine till  
*Native plant cover type:* Forest land  
*Flooding:* None  
*Available water capacity:* Mainly 6.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

## Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Forest Land" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## 61--Flott very gravelly loam, dry, 30 to 60 percent slopes

### Setting

*Landform:* Mountains  
*Slope:* 30 to 60 percent  
*Elevation:* 2,900 to 4,000 feet  
*Mean annual precipitation:* 18 to 20 inches  
*Frost-free period:* 90 to 105 days

### Composition

#### Major Components

Flott and similar soils: 90 percent

#### Minor Components

Kingspoint and similar soils: 0 to 8 percent  
Areas of rock outcrop: 0 to 2 percent

### Major Component Description

*Surface layer texture:* Very gravelly loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Alpine till  
*Native plant cover type:* Forest land  
*Flooding:* None  
*Available water capacity:* Mainly 5.7 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

## Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Forest Land" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## Gardencreek Series

Gardencreek series consists of very deep, moderately well drained soils on flood plains. These soils formed in alluvium. Slope is 0 to 2 percent. Elevation is 2,600 to 2,800 feet. The average annual precipitation is 10 to 14 inches, average annual air temperature is 42 to 45 degrees F, and the frost-free period is 100 to 115 days.

**Taxonomic Class:** Fine, mixed, nonacid, frigid Aquic Xerofluvents

### Typical Pedon

Gardencreek silty clay loam, 0 to 2 percent slopes, in an area of pasture; 1,950 feet north and 100 feet east of the southwest corner of sec. 3, T. 21 N., R. 23 W.

A--0 to 6 inches; gray (10YR 6/1) silty clay loam, dark grayish brown (10YR 4/2) moist; moderate fine and medium granular structure; slightly hard, friable, slightly sticky and slightly plastic; common fine roots; common very fine tubular pores; mildly alkaline; abrupt smooth boundary.

C1--6 to 10 inches; light gray (10YR 7/1) silty clay loam, dark grayish brown (10YR 4/2) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; common fine roots; common very fine tubular pores; mildly alkaline; clear smooth boundary.

C2--10 to 20 inches; light gray (5Y 7/1) silty clay loam, gray (5Y 5/1) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; common fine roots; few medium pores and many fine pores; mildly alkaline; clear smooth boundary.

C3--20 to 38 inches; light gray (5Y 7/1) silty clay loam, gray (5Y 6/1) moist; massive; hard, firm, sticky and plastic; few fine and very fine roots; common very fine tubular pores; mildly alkaline; gradual smooth boundary.

C4--38 to 60 inches; light gray (5Y 7/1) silty clay loam, light olive gray (5Y 6/2) moist; massive; hard, firm, sticky and plastic; common medium

brownish yellow (10YR 6/6) mottles; few very fine tubular pores; mildly alkaline.

### Range in Characteristics

*Depth to seasonal water table:* 48 to 72 degrees F

*Soil temperature:* 43 to 47 degrees F

*Moisture control section:* Between 4 and 12 inches

*Content of clay in the control section:* 35 to 60 percent

#### A horizon

Hue: 10YR or 2.5YR

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 1 or 2

Clay content: 27 to 35 percent

Reaction: pH 6.6 to 7.8

#### C1 horizon

Hue: 10YR, 2.5YR, or 5Y

Value: 5, 6, or 7 dry; 4 or 5 moist

Chroma: 1 or 2

Clay content: 30 to 40 percent

Reaction: pH 6.6 to 7.8

#### C2 horizon

Hue: 2.5Y or 5Y

Value: 5, 6, or 7 dry; 3, 4, or 5 moist

Chroma: 1 or 2

Clay content: 30 to 40 percent

Reaction: pH 6.6 to 7.8

#### C3 horizon

Value: 6, 7, or 8 dry; 4, 5, or 6 moist

Chroma: 0 or 1

Texture: Silty clay or silty clay loam

Clay content: 35 to 60 percent

Reaction: pH 7.4 to 8.4

#### C4 horizon

Value: 6, 7, or 8 dry; 4, 5, or 6 moist

Chroma: 1 or 2

Texture: Silty clay or silty clay loam

Clay content: 35 to 60 percent

Reaction: pH 7.4 to 8.4

## 62--Gardencreek silty clay loam, 0 to 2 percent slopes

### Setting

*Landform:* Flood plains

*Slope:* 0 to 2 percent

*Elevation:* 2,600 to 2,800 feet

*Mean annual precipitation:* 10 to 14 inches

*Frost-free period:* 100 to 115 days

## Composition

### Major Components

Gardencreek and similar soils: 90 percent

### Minor Components

Marklepass and similar soils: 0 to 5 percent

Bohnlly and similar soils: 0 to 5 percent

### Major Component Description

*Surface layer texture:* Silty clay loam

*Depth class:* Very deep (more than 60 inches)

*Drainage class:* Moderately well drained

*Dominant parent material:* Alluvium

*Native plant cover type:* Rangeland

*Flooding:* Rare

*Water table:* Apparent

*Available water capacity:* Mainly 10.4 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

### Gird Series

Gird series consists of very deep, well drained and moderately well drained soils on lake plains, flood plains, alluvial fans, and stream terraces. These soils formed in glaciofluvial and glaciolacustrine deposits. Slope is 0 to 15 percent. Elevation is 2,600 to 3,500 feet. The average annual precipitation is about 14 to 17 inches, average annual air temperature is 40 to 45 degrees F, and the frost-free period is 105 to 125 days.

**Taxonomic Class:** Coarse-silty, mixed, frigid Calcic Haploxerolls

## Typical Pedon

Gird silt loam, 0 to 2 percent slopes, in an area of cropland; approximately 300 feet east and 150 feet north of the southwest corner of sec. 30, T. 21 N., R. 19 W.

Ap--0 to 10 inches; grayish brown (10YR 5/2) silt loam, very dark brown (10YR 2/2) moist; weak fine granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots; common very fine pores; neutral; abrupt smooth boundary.

Bw--10 to 17 inches; brown (10YR 5/3) silt loam, dark brown (10YR 4/3) moist; moderate medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; many very fine and fine roots; common very fine pores; neutral; clear smooth boundary.

Bk1--17 to 32 inches; pale brown (10YR 6/3) silt loam, brown (10YR 5/3) moist; weak coarse subangular blocky structure; soft, very friable, nonsticky and nonplastic; few very fine and fine roots; common very fine pores; disseminated lime and common fine masses of lime; strongly effervescent; mildly alkaline; gradual wavy boundary.

Bk2--32 to 60 inches; light gray (10YR 7/2) silt loam, pale brown (10YR 6/3) moist; massive; soft, very friable, nonsticky and nonplastic; few very fine roots; few very fine pores; disseminated lime and common fine masses of lime; strongly effervescent; moderately alkaline.

### Range in Characteristics

*Soil temperature:* 42 to 47 degrees F

*Moisture control section:* Between 4 and 12 inches

*Mollic epipedon thickness:* 10 to 17 inches

*Depth to Bk horizon:* 12 to 21 inches

*Depth to water table:* 36 to 48 inches in moderately wet phase

*Other features:* Some pedons have a BC or C horizon between 40 and 60 inches

#### Ap horizon

Value: 4 or 5 dry; 2 or 3 moist

Chroma: 2 or 3

Clay content: 10 to 18 percent

Reaction: pH 6.6 to 7.3

#### Bw horizon

Value: 4 or 5 dry; 3 or 4 moist

Clay content: 10 to 18 percent

Reaction: pH 6.6 to 7.8

Other features: All or part of this horizon may have mollic colors

#### Bk1 horizon

Hue: 10YR, 7.5YR

Value: 6 or 7 dry; 4 or 5 moist

Chroma: 2 or 3

Clay content: 10 to 18 percent

Calcium carbonate equivalent: 5 to 10 percent

Reaction: pH 7.4 to 8.4

#### Bk2 horizon

Hue: 10YR, 7.5YR

Value: 6 or 7 dry; 4, 5, or 6 moist

Chroma: 2 or 3

Texture: Silt loam or very fine sandy loam

Clay content: 10 to 18 percent

Calcium carbonate equivalent: 3 to 10 percent

Reaction: pH 7.4 to 8.4

## 63--Gird silt loam, 0 to 2 percent slopes

### Setting

*Landform:* Alluvial fans and stream terraces

*Slope:* 0 to 2 percent

*Elevation:* 2,800 to 3,500 feet

*Mean annual precipitation:* 14 to 17 inches

*Frost-free period:* 105 to 125 days

### Composition

#### Major Components

Gird and similar soils: 85 percent

#### Minor Components

McCollum and similar soils: 0 to 5 percent

Polson and similar soils: 0 to 5 percent

Ninepipe and similar soils: 0 to 3 percent

Dubay soils east of hwy. 93: 0 to 2 percent

### Major Component Description

*Surface layer texture:* Silt loam

*Depth class:* Very deep (more than 60 inches)

*Drainage class:* Well drained

*Dominant parent material:* Glaciofluvial deposits

*Flooding:* None

*Available water capacity:* Mainly 10.4 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

## Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## 64--Gird silt loam, 2 to 4 percent slopes

### Setting

*Landform:* Alluvial fans and stream terraces  
*Slope:* 2 to 4 percent  
*Elevation:* 2,800 to 3,500 feet  
*Mean annual precipitation:* 14 to 17 inches  
*Frost-free period:* 105 to 125 days

### Composition

#### Major Components

Gird and similar soils: 85 percent

#### Minor Components

McCollum and similar soils: 0 to 5 percent  
Polson and similar soils: 0 to 5 percent  
Ninepipe and similar soils: 0 to 3 percent  
Dubay soils east of hwy. 93: 0 to 2 percent

### Major Component Description

*Surface layer texture:* Silt loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Glaciofluvial deposits  
*Flooding:* None  
*Available water capacity:* Mainly 10.4 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

## Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Agronomy" section
- \* "Recreation" section

- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## 65--Gird-Dryfork silt loams, moderately wet, 0 to 1 percent slopes

### Setting

#### Landform:

- \* Gird--Flood plains
- \* Dryfork--Flood plains

#### Slope:

- \* Gird--0 to 1 percent
- \* Dryfork--0 to 1 percent

*Elevation:* 2,600 to 3,500 feet

*Mean annual precipitation:* 14 to 17 inches

*Frost-free period:* 105 to 120 days

### Composition

#### Major Components

Gird and similar soils: 45 percent  
Dryfork and similar soils: 40 percent

#### Minor Components

Colake and similar soils: 0 to 5 percent  
Areas of slickspots: 0 to 5 percent  
Indurated lime below 30 inches: 0 to 5 percent

### Major Component Description

#### Gird

*Surface layer texture:* Silt loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Moderately well drained  
*Dominant parent material:* Glaciolacustrine deposits  
*Flooding:* Rare  
*Water table:* Apparent  
*Available water capacity:* Mainly 10.8 inches

#### Dryfork

*Surface layer texture:* Silt loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Moderately well drained  
*Dominant parent material:* Glaciolacustrine deposits  
*Flooding:* Rare  
*Water table:* Apparent  
*Sodium affected:* Sodic within 30 inches  
*Available water capacity:* Mainly 10.3 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is

available in the "Soil Properties" section, Part II, of this publication.

### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## 66--Gird-Vincom silt loams, 4 to 8 percent slopes

### Setting

#### Landform:

- \* Gird--Lake plains
- \* Vincom--Lake plains

#### Position on landform:

- \* Gird--Foot slopes and toe slopes
- \* Vincom--Back slopes and shoulders

#### Slope:

- \* Gird--4 to 8 percent
- \* Vincom--4 to 8 percent

*Elevation:* 2,600 to 3,200 feet

*Mean annual precipitation:* 14 to 15 inches

*Frost-free period:* 105 to 120 days

### Composition

#### Major Components

Gird and similar soils: 55 percent

Vincom and similar soils: 35 percent

#### Minor Components

Truscreek and similar soils: 0 to 4 percent

Dryfork and similar soils: 0 to 3 percent

Selow and similar soils: 0 to 3 percent

### Major Component Description

#### Gird

*Surface layer texture:* Silt loam

*Depth class:* Very deep (more than 60 inches)

*Drainage class:* Well drained

*Dominant parent material:* Glaciolacustrine deposits

*Flooding:* None

*Available water capacity:* Mainly 10.4 inches

#### Vincom

*Surface layer texture:* Silt loam

*Depth class:* Very deep (more than 60 inches)

*Drainage class:* Well drained

*Dominant parent material:* Lacustrine deposits

*Flooding:* None

*Sodium affected:* Sodic within 30 inches

*Available water capacity:* Mainly 9.0 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## 67--Gird-Vincom silt loams, 8 to 15 percent slopes

### Setting

#### Landform:

- \* Gird--Lake plains
- \* Vincom--Lake plains

#### Position on landform:

- \* Gird--Foot slopes and toe slopes
- \* Vincom--Back slopes and shoulders

#### Slope:

- \* Gird--8 to 15 percent
- \* Vincom--8 to 15 percent

*Elevation:* 2,600 to 3,200 feet

*Mean annual precipitation:* 14 to 15 inches

*Frost-free period:* 105 to 120 days

### Composition

#### Major Components

Gird and similar soils: 50 percent

Vincom and similar soils: 40 percent

#### Minor Components

Truscreek and similar soils: 0 to 3 percent

Dryfork and similar soils: 0 to 2 percent

Selow and similar soils: 0 to 3 percent

Kerrdam and similar soils: 0 to 2 percent

## Major Component Description

### Gird

*Surface layer texture:* Silt loam

*Depth class:* Very deep (more than 60 inches)

*Drainage class:* Well drained

*Dominant parent material:* Glaciolacustrine deposits

*Flooding:* None

*Available water capacity:* Mainly 10.5 inches

### Vincom

*Surface layer texture:* Silt loam

*Depth class:* Very deep (more than 60 inches)

*Drainage class:* Well drained

*Dominant parent material:* Lacustrine deposits

*Flooding:* None

*Sodium affected:* Sodic within 30 inches

*Available water capacity:* Mainly 9.0 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

## Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## Glaciercreek Series

Glaciercreek series consists of very deep, excessively drained soils that formed in glacial outwash. The surface layer has a large component of volcanic ash. These soils are on outwash plains and stream terraces. Slope is 2 to 4 percent. Elevation is 3,000 to 3,400 feet. The average annual precipitation is 22 to 30 inches, average annual air temperature is 40 to 44 degrees F, and the frost-free period is 60 to 90 days.

**Taxonomic Class:** Sandy-skeletal, mixed, frigid Andic Eutrochrepts

## Typical Pedon

Glaciercreek gravelly silt loam, 2 to 4 percent slopes, in an area of woodland; 1,000 feet east and 1,500 feet north of the southwest corner of sec. 18, T. 26 N., R. 18 W.

O--3 inches to 0; undecomposed and slightly decomposed forest litter.

Bs--0 to 11 inches; light yellowish brown (10YR 6/4) gravelly silt loam, dark yellowish brown (10YR 4/4) moist; moderate fine granular structure; soft, very friable, nonsticky and nonplastic; many roots; 20 percent pebbles; slightly acid; clear wavy boundary.

2Bw--11 to 17 inches; light gray (10YR 7/1) very gravelly coarse sandy loam, brown (10YR 5/3) moist; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; many fine and medium roots; 60 percent pebbles; medium acid; clear wavy boundary.

2C1--17 to 26 inches; light brownish gray (10YR 6/2) extremely gravelly loamy sand, brown (10YR 5/3) moist; single grain; loose, loose, nonsticky and nonplastic; common fine and medium roots; 65 percent pebbles and 15 percent cobbles; slightly acid; clear wavy boundary.

2C2--26 to 60 inches; light brownish gray (10YR 6/2) extremely gravelly loamy sand, brown (10YR 5/3) moist; single grain; loose, loose, nonsticky and nonplastic; few fine and medium roots; 75 percent pebbles and 15 percent cobbles; medium acid.

## Range in Characteristics

*Soil temperature:* 40 to 45 degrees F

*Moisture control section:* Between 12 and 35 inches

*Depth to 2C horizon:* 10 to 18 inches

*Base saturation:* 60 to 85 percent

*Content of clay in the control section:* 2 to 12 percent

*Other features:* Some pedons have a 2E horizon

### Bs horizon

Value: 5, 6, or 7 dry; 4 or 5 moist

Chroma: 3 or 4

Clay content: 5 to 15 percent

Content of rock fragments: 15 to 35 percent--0 to 10 percent cobbles and stones, 15 to 25 percent pebbles

Moist bulk density: Less than .95 g/cc

Reaction: pH 5.6 to 7.3

### 2C horizons

Hue: 10YR or 7.5YR  
Value: 6 or 7 dry; 3, 4, or 5 moist  
Chroma: 2, 3, or 4  
Texture: Loamy sand, loamy coarse sand, coarse sand, or sand  
Clay content: 0 to 10 percent  
Content of rock fragments: 60 to 90 percent--5 to 30 percent cobbles and stones, 55 to 75 percent pebbles  
Reaction: pH 5.6 to 7.3

## 68--Glaciercreek gravelly silt loam, 2 to 4 percent slopes

### Setting

*Landform:* Stream terraces and outwash plains  
*Slope:* 2 to 4 percent  
*Elevation:* 3,000 to 3,400 feet  
*Mean annual precipitation:* 22 to 30 inches  
*Frost-free period:* 60 to 90 days

### Composition

#### Major Components

Glaciercreek and similar soils: 90 percent

#### Minor Components

Courville and similar soils: 0 to 5 percent  
Half Moon and similar soils: 0 to 5 percent

### Major Component Description

*Surface layer texture:* Gravelly silt loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Excessively drained  
*Dominant parent material:* Glacial outwash  
*Native plant cover type:* Forest land  
*Flooding:* None  
*Available water capacity:* Mainly 2.3 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

\* "Range" section

- \* "Forest Land" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## Half Moon Series

Half Moon series consists of very deep, well drained soils on outwash plains. These soils formed in glaciolacustrine deposits. Slope is 2 to 15 percent. Elevation is 3,000 to 3,200 feet. The average annual precipitation is 20 to 30 inches, average annual air temperature is 40 to 44 degrees F, and the frost-free period is 75 to 90 days.

**Taxonomic Class:** Fine-silty, mixed Glossic Eutroboralfs

### Typical Pedon

Half Moon silt loam, 2 to 4 percent slopes, in an area of woodland; approximately 2,200 feet north and 1,400 feet west of the southeast corner of sec. 3, T. 26 N., R. 19 W.

Oe--2 inches to 0; partially decomposed needles and twigs.

E--0 to 11 inches; light gray (10YR 7/2) silt loam, brown (10YR 5/3) moist; weak fine and medium granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots and common medium and coarse roots; 5 percent pebbles; neutral; clear wavy boundary.

E/Bt--11 to 16 inches; 70 percent is white (10YR 8/2) silt loam, light brownish gray (10YR 6/2) moist (E part); 30 percent is very pale brown (10YR 7/3) silty clay loam, brown (10YR 5/3) moist (B part); texture mixed is silty clay loam; moderate medium subangular blocky structure; slightly hard, friable, sticky and plastic; many very fine and fine roots and common medium and coarse roots; 5 percent pebbles; neutral; abrupt wavy boundary.

Bt--16 to 26 inches; very pale brown (10YR 7/3) silty clay loam, pale brown (10YR 6/3) moist; moderate medium and coarse subangular blocky structure; slightly hard, friable, sticky and plastic; common very fine, fine, and medium roots; common distinct yellowish brown (10YR 5/4) moist clay films on faces of peds and in pores; 5 percent pebbles; neutral; abrupt wavy boundary.

Bk--26 to 37 inches; light gray (10YR 7/2) silty clay loam, pale brown (10YR 6/3) moist; moderate medium subangular blocky structure; slightly hard, friable, sticky and plastic; common very fine, fine, and medium roots; few fine soft masses of lime; strongly effervescent; moderately alkaline; clear smooth boundary.

C--37 to 60 inches; light gray (10YR 7/2) silty clay loam, pale brown (10YR 6/3) moist; massive; slightly hard, friable, sticky and plastic; few very fine and fine roots; moderately alkaline.

### Range in Characteristics

*Soil temperature:* 42 to 46 degrees F

*Moisture control section:* Between 4 and 12 inches

*Content of clay in the control section:* 25 to 35 percent

*Depth to Bk horizon:* 14 to 35 inches

*Other features:* Some pedons have a thin, discontinuous A horizon

#### *E horizon*

Hue: 2.5Y, 10YR, or 7.5YR

Value: 6, 7, or 8 dry; 4, 5, 6, or 7 moist

Chroma: 1, 2, or 3

Clay content: 15 to 25 percent

Content of rock fragments: 0 to 15 percent--0 to 10 percent cobbles, 0 to 5 percent pebbles

Reaction: pH 4.5 to 7.3

#### *E/Bt horizon*

Hue: E part--2.5Y, 10YR, or 7.5YR; B part--2.5Y, 10YR or 7.5YR

Value: E part--7 or 8 dry and 6 or 7 moist; B part--6 or 7 dry and 4, 5, or 6 moist

Chroma: E part--2 or 3, B part--3 or 4

Texture: Silt loam or silty clay loam

Clay content: 25 to 35 percent

Content of rock fragments: 0 to 10 percent--0 to 5 percent cobbles, 0 to 5 percent pebbles

Reaction: pH 6.1 to 7.8

#### *Bt horizon*

Hue: 2.5Y, 10YR, or 7.5YR

Value: 6 or 7 dry; 4, 5, or 6 moist

Chroma: 3 or 4

Texture: Silt loam or silty clay loam

Clay content: 25 to 35 percent

Content of rock fragments: 0 to 10 percent pebbles

Reaction: pH 6.1 to 7.8

#### *Bk horizon*

Hue: 2.5Y, 10YR, or 7.5YR

Value: 6 or 7 dry; 5 or 6 moist

Chroma: 2, 3, or 4

Texture: Silt loam or silty clay loam

Clay content: 25 to 30 percent

Calcium carbonate equivalent: 5 to 15 percent

Electrical conductivity: 0 to 4 mmhos/cc

Reaction: pH 7.4 to 8.4

#### *C horizon*

Hue: 2.5Y, 10YR, or 7.5YR

Value: 6 or 7 dry; 5 or 6 moist

Chroma: 2, 3, or 4

Texture: Mainly very fine sandy loam, silt loam, or silty clay loam that has thin lenses of silty clay

Clay content: 20 to 30 percent

Electrical conductivity: 0 to 4 mmhos/cc

Reaction: pH 7.9 to 9.0

## 69--Half Moon silt loam, 2 to 4 percent slopes

### Setting

*Landform:* Outwash plains

*Slope:* 2 to 4 percent

*Elevation:* 3,000 to 3,200 feet

*Mean annual precipitation:* 20 to 30 inches

*Frost-free period:* 75 to 90 days

### Composition

#### Major Components

Half Moon and similar soils: 85 percent

#### Minor Components

Rumblecreek and similar soils: 0 to 5 percent

Courville and similar soils: 0 to 5 percent

Somewhat poorly drained soils: 0 to 3 percent

Poorly drained soils: 0 to 2 percent

### Major Component Description

*Surface layer texture:* Silt loam

*Depth class:* Very deep (more than 60 inches)

*Drainage class:* Well drained

*Dominant parent material:* Glaciolacustrine deposits

*Native plant cover type:* Forest land

*Flooding:* None

*Available water capacity:* Mainly 10.3 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

## Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Forest Land" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## 70--Half Moon--Courville complex, 4 to 15 percent slopes

### Setting

#### *Landform:*

- \* Half Moon--Outwash plains
- \* Courville--Outwash plains

#### *Position on landform:*

- \* Half Moon--Back slopes and foot slopes
- \* Courville--Back slopes and shoulders

#### *Slope:*

- \* Half Moon--4 to 15 percent
- \* Courville--4 to 15 percent

#### *Elevation:* 3,000 to 3,200 feet

#### *Mean annual precipitation:* 25 to 30 inches

#### *Frost-free period:* 75 to 90 days

### Composition

#### **Major Components**

Half Moon and similar soils: 50 percent  
Courville and similar soils: 35 percent

#### **Minor Components**

Rumblecreek and similar soils: 0 to 13 percent  
Somewhat poorly drained soils: 0 to 2 percent

### Major Component Description

#### **Half Moon**

*Surface layer texture:* Silt loam

*Depth class:* Very deep (more than 60 inches)

*Drainage class:* Well drained

*Dominant parent material:* Glaciolacustrine deposits

*Native plant cover type:* Forest land

*Flooding:* None

*Available water capacity:* Mainly 11.0 inches

#### **Courville**

*Surface layer texture:* Gravelly silt loam

*Depth class:* Very deep (more than 60 inches)

*Drainage class:* Well drained

*Dominant parent material:* Alpine till

*Native plant cover type:* Forest land

*Flooding:* None

*Available water capacity:* Mainly 6.4 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

## Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Forest Land" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## Hogsby Series

Hogsby series consists of shallow, well drained soils formed in argillite residuum and colluvium derived from argillite or quartzite. These soils are on mountains. Slope is 15 to 60 percent. Elevation is 3,000 to 6,000 feet. The average annual precipitation is 15 to 19 inches, average annual air temperature is 39 to 43 degrees F, and the frost-free period is 105 to 120 days.

**Taxonomic Class:** Loamy-skeletal, mixed, frigid Lithic Haploxerolls

### Typical Pedon

Hogsby gravelly loam in an area of Bigarm-Hogsby-Rock outcrop complex, 30 to 60 percent slopes, in rangeland; 200 feet east and 800 feet north of the southwest corner of sec. 19, T. 23 N., R. 21 W.

A1--0 to 6 inches; dark grayish brown (10YR 4/2) gravelly loam, very dark grayish brown (10YR 3/2) moist; moderate medium granular structure; soft, very friable, slightly sticky and slightly plastic; many fine roots; many fine pores; 20 percent pebbles; neutral; abrupt smooth boundary.

A2--6 to 15 inches; brown (10YR 5/3) extremely channery loam, dark brown (10YR 3/3) moist; moderate medium subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; many fine roots; many fine pores; 55 percent channers and 15 percent flagstones; neutral; abrupt smooth boundary.  
R--15 inches; quartzite bedrock.

### Range in Characteristics

*Soil temperature:* 43 to 47 degrees F  
*Moisture control section:* Between 4 to 12 inches  
*Mollic epipedon thickness:* 7 to 15 inches  
*Control section:* 10 to 20 percent clay and 45 to 80 percent rock fragments  
*Depth to bedrock:* 10 to 20 inches; some soils have a thin cambic horizon above the bedrock  
*Soil phases:* Stony  
*Other taxonomic features:* Hogsby soil is a taxajunct to the series in map unit 71 because it has an ustic moisture regime. It classifies as a Loamy-skeletal, mixed, frigid Lithic Haploboroll (in map unit 71 only).

#### A horizon

Hue: 2.5Y, 10YR, 7.5YR, or 5YR  
Value: 4 or 5 dry; 2 or 3 moist  
Chroma: 2 or 3  
Clay content: 5 to 20 percent  
Content of rock fragments: 5 to 35 percent--0 to 10 percent stones, 0 to 5 percent cobbles or flagstones, 5 to 30 percent pebbles or channers  
Reaction: pH 6.6 to 7.3

#### A2 horizon

Hue: 2.5Y, 10YR, 7.5YR, or 5YR  
Value: 5 to 6 dry; 3 to 4 moist  
Chroma: 2 or 3  
Texture: Loam or sandy loam  
Clay content: 10 to 20 percent  
Content of rock fragments: 45 to 80 percent--15 to 25 percent cobbles or flagstones, 30 to 55 percent pebbles or channers  
Reaction: pH 6.6 to 7.3

## 71--Hogsby-Finley point gravelly loams, 30 to 60 percent slopes

### Setting

#### *Landform:*

- \* Hogsby--Mountains
- \* Finley point--Mountains

#### *Position on landform:*

- \* Hogsby--Back slopes and shoulders
- \* Finley point--Foot slopes and toe slopes

#### *Slope:*

- \* Hogsby--30 to 60 percent
- \* Finley point--30 to 60 percent

*Elevation:* 3,000 to 6,000 feet

*Mean annual precipitation:* 15 to 19 inches

*Frost-free period:* 105 to 120 days

### Composition

#### Major Components

Hogsby and similar soils: 60 percent  
Finley point and similar soils: 25 percent

#### Minor Components

Wildgen and similar soils: 0 to 4 percent  
Kingspoint and similar soils: 0 to 4 percent  
Repp and similar soils: 0 to 4 percent  
Areas of rock outcrop: 0 to 3 percent

### Major Component Description

#### Hogsby

*Surface layer texture:* Gravelly loam  
*Depth class:* Shallow (10 to 20 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Colluvium  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 1.4 inches

#### Finley point

*Surface layer texture:* Gravelly loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Colluvium  
*Native plant cover type:* Forest land  
*Flooding:* None  
*Available water capacity:* Mainly 5.9 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Forest Land" section
- \* "Agronomy" section

- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## 72--Hogsby-Rock outcrop complex, 15 to 45 percent slopes

### Setting

*Landform:* Mountains

*Position on landform:*

- \* Hogsby--Back slopes and foot slopes
- \* Rock outcrop--Shoulders and summits

*Slope:* 15 to 45 percent

*Elevation:* 3,000 to 5,000 feet

*Mean annual precipitation:* 15 to 19 inches

*Frost-free period:* 105 to 120 days

### Composition

#### Major Components

Hogsby and similar soils: 60 percent

Rock outcrop: 25 percent

#### Minor Components

Finleypoint and similar soils: 0 to 5 percent

Bigarm and similar soils: 0 to 5 percent

Areas of rubble land: 0 to 5 percent

### Major Component Description

#### Hogsby

*Surface layer texture:* Stony loam

*Depth class:* Shallow (10 to 20 inches)

*Drainage class:* Well drained

*Dominant parent material:* Colluvium

*Native plant cover type:* Rangeland

*Flooding:* None

*Available water capacity:* Mainly 1.6 inches

#### Rock outcrop

*Definition:* Exposures of bare bedrock

*Dominant parent material:* Argillite residuum

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

## Holloway Series

Holloway series consists of very deep, somewhat excessively drained soils on mountain slopes. These soils formed in colluvium derived from argillite and quartzite. They have a surface layer of volcanic ash-influenced loess. Slope is 15 to 75 percent. Elevation is 4,200 to 7,000 feet. The average annual precipitation is 25 to 60 inches, average annual air temperature is 37 to 42 degrees F, and the frost-free period is 30 to 60 days.

**Taxonomic Class:** Loamy-skeletal, mixed Andic Cryochrepts

### Typical Pedon

Holloway gravelly silt loam, 30 to 60 percent slopes, in an area of woodland; approximately 1,800 feet west and 2,100 feet north of the southeast corner of sec. 11, T. 25 N., R. 21 W.

Oe--2 inches to 0; decomposed forest litter.  
Bs--0 to 10 inches; light yellowish brown (10YR 6/4) gravelly silt loam, dark yellowish brown (10YR 4/4) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine and fine roots and common medium roots; 30 percent pebbles and 5 percent cobbles; slightly acid; abrupt smooth boundary.

2E--10 to 26 inches; light gray (10YR 7/2) extremely channery fine sandy loam, light brownish gray (10YR 6/2) moist; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; many fine and

medium roots; common fine and very fine pores; 60 percent channers and 10 percent flagstones; medium acid; gradual smooth boundary.

2E and Bt--26 to 42 inches; 70 percent is light gray (10YR 7/2) extremely channery fine sandy loam, light brownish gray (10YR 6/2) moist (E part); 30 percent is light yellowish brown (10YR 6/4) fine sandy loam lamellae, dark yellowish brown (10YR 4/4) moist (B part); weak fine and medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; common fine roots; common fine pores; 70 percent channers and 10 percent flagstones; medium acid; clear smooth boundary.

2C--42 to 60 inches; light gray (10YR 7/2) extremely channery fine sandy loam, dark yellowish brown (10YR 6/4) moist; massive; soft, very friable, nonsticky and nonplastic; few fine roots; common very fine pores; 70 percent channers and 10 percent flagstones; medium acid.

### Range in Characteristics

*Soil temperature:* 39 to 44 degrees F

*Moisture control section:* Between 8 and 24 inches

*Control section:* 5 to 15 percent clay and less than 35 percent silt and 60 percent or more total sand (more than 35 percent fine sand and coarser)

*Other features:* Some pedons have a thin discontinuous E horizon

#### *Bs horizon*

Hue: 10YR or 7.5YR

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 4 or 6

Clay content: 5 to 15 percent

Content of rock fragments: 10 to 35 percent--0 to 10 percent angular cobbles or flagstones and stones, 10 to 30 percent angular pebbles or channers

Bulk density: 1.0 g/cc or less

Glass content: 5 to 10 percent; acid-oxalate aluminum plus 1/2-iron--1 to 2 percent

Reaction: pH 5.1 to 6.5

#### *2E horizon*

Hue: 10YR or 7.5YR

Value: 6, 7, or 8 dry; 5 or 6 moist

Chroma: 2 or 3

Texture: Loam, sandy loam, or fine sandy loam

Clay content: 5 to 15 percent

Content of rock fragments: 45 to 75 percent--0 to 15 percent angular cobbles or flagstones and stones, 45 to 60 percent angular pebbles or channers

Reaction: pH 5.1 to 6.5

#### *2E and Bt horizon*

Hue: E part--10YR or 7.5YR; B part--10YR or 7.5YR

Value: E part--6 or 7 dry and 5 or 6 moist; B part--5 or 6 dry and 4 or 5 moist

Chroma: E part--2 or 3; B part--2, 3 or 4

Texture: Sandy loam or fine sandy loam

Clay content: 5 to 15 percent; the lamellae have less than 3 percent clay increase

Content of rock fragments: 60 to 80 percent--5 to 15 percent angular cobbles or flagstones and stones, 55 to 70 percent angular pebbles or channers

Reaction: pH 5.1 to 6.5

#### *2C horizon*

Hue: 10YR or 7.5YR

Value: 6 or 7 dry; 5 or 6 moist

Chroma: 2, 3, or 4

Texture: Fine sandy loam, sandy loam, or loamy sand

Clay content: 5 to 15 percent

Content of rock fragments: 60 to 85 percent--5 to 20 percent angular cobbles or flagstones and stones, 55 to 70 percent angular pebbles or channers

Reaction: pH 5.1 to 6.5

## 73--Holloway gravelly silt loam, 15 to 30 percent slopes

### Setting

*Landform:* Mountains

*Slope:* 15 to 30 percent

*Elevation:* 4,200 to 6,500 feet

*Mean annual precipitation:* 25 to 60 inches

*Frost-free period:* 30 to 60 days

### Composition

#### Major Components

Holloway and similar soils: 85 percent

#### Minor Components

Mitten and similar soils: 0 to 5 percent

Tevis and similar soils: 0 to 4 percent

Waldbillig and similar soils: 0 to 4 percent

Soils 10 to 40 inches to rock: 0 to 2 percent

## Major Component Description

*Surface layer texture:* Gravelly silt loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Somewhat excessively drained  
*Dominant parent material:* Colluvium  
*Native plant cover type:* Forest land  
*Flooding:* None  
*Available water capacity:* Mainly 3.5 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

## Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Forest Land" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## 74--Holloway gravelly silt loam, 30 to 60 percent slopes

### Setting

*Landform:* Mountains  
*Slope:* 30 to 60 percent  
*Elevation:* 4,200 to 6,500 feet  
*Mean annual precipitation:* 25 to 60 inches  
*Frost-free period:* 30 to 60 days

### Composition

#### Major Components

Holloway and similar soils: 85 percent

#### Minor Components

Mitten and similar soils: 0 to 4 percent  
Tevis and similar soils: 0 to 3 percent  
Waldbillig and similar soils: 0 to 4 percent  
Soils 10 to 40 inches to rock: 0 to 2 percent  
Areas of rock outcrop: 0 to 2 percent

### Major Component Description

*Surface layer texture:* Gravelly silt loam

*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Somewhat excessively drained  
*Dominant parent material:* Colluvium  
*Native plant cover type:* Forest land  
*Flooding:* None  
*Available water capacity:* Mainly 3.6 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

## Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Forest Land" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## 75--Holloway gravelly silt loam, cool, 15 to 30 percent slopes

### Setting

*Landform:* Mountains  
*Slope:* 15 to 30 percent  
*Elevation:* 5,600 to 6,600 feet  
*Mean annual precipitation:* 25 to 60 inches  
*Frost-free period:* 30 to 60 days

### Composition

#### Major Components

Holloway and similar soils: 85 percent

#### Minor Components

Felan and similar soils: 0 to 5 percent  
Holloway and similar soils: 0 to 5 percent  
Areas of rock outcrop: 0 to 3 percent  
Soils 10 to 40 inches to rock: 0 to 2 percent

### Major Component Description

*Surface layer texture:* Gravelly silt loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Somewhat excessively drained  
*Dominant parent material:* Colluvium  
*Native plant cover type:* Forest land

*Flooding:* None

*Available water capacity:* Mainly 3.3 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Forest Land" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## 76--Holloway gravelly silt loam, cool, 30 to 60 percent slopes

### Setting

*Landform:* Mountains

*Slope:* 30 to 60 percent

*Elevation:* 5,600 to 6,600 feet

*Mean annual precipitation:* 25 to 60 inches

*Frost-free period:* 30 to 60 days

### Composition

#### Major Components

Holloway and similar soils: 85 percent

#### Minor Components

Felan and similar soils: 0 to 5 percent

Holloway and similar soils: 0 to 5 percent

Areas of rock outcrop: 0 to 3 percent

Soils 10 to 40 inches to rock: 0 to 2 percent

### Major Component Description

*Surface layer texture:* Gravelly silt loam

*Depth class:* Very deep (more than 60 inches)

*Drainage class:* Somewhat excessively drained

*Dominant parent material:* Colluvium

*Native plant cover type:* Forest land

*Flooding:* None

*Available water capacity:* Mainly 3.4 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Forest Land" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## 77--Holloway, dry-Rock outcrop complex, 15 to 30 percent slopes

### Setting

*Landform:* Mountains

*Position on landform:*

- \* Holloway--Back slopes

- \* Rock outcrop--Shoulders and summits

*Slope:*

- \* Holloway--15 to 30 percent

- \* Rock outcrop--15 to 30 percent

*Elevation:* 4,800 to 5,500 feet

*Mean annual precipitation:* 25 to 35 inches

*Frost-free period:* 30 to 60 days

### Composition

#### Major Components

Holloway and similar soils: 65 percent

Rock outcrop: 20 percent

#### Minor Components

Soils 10 to 40 inches to rock: 0 to 10 percent

Fragmental subsoil material: 0 to 5 percent

### Major Component Description

#### Holloway

*Surface layer texture:* Gravelly silt loam

*Depth class:* Very deep (more than 60 inches)

*Drainage class:* Somewhat excessively drained

*Dominant parent material:* Colluvium

*Native plant cover type:* Forest land

*Flooding:* None

*Available water capacity:* Mainly 3.0 inches

### **Rock outcrop**

*Definition:* Exposures of bare bedrock

*Dominant parent material:* Argillite residuum

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### **Management**

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Forest Land" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## **78--Holloway-Rubble land complex, 45 to 75 percent slopes**

### **Setting**

*Landform:*

- \* Holloway--Mountains
- \* Rubble land--Mountains

*Position on landform:*

- \* Holloway--Back slopes and shoulders
- \* Rubble land--Foot slopes

*Slope:* 45 to 75 percent

*Elevation:* 5,000 to 7,000 feet

*Mean annual precipitation:* 40 to 60 inches

*Frost-free period:* 30 to 60 days

### **Composition**

#### **Major Components**

Holloway and similar soils: 55 percent

Rubble land: 30 percent

#### **Minor Components**

Soils 10 to 40 inches to rock: 0 to 5 percent

Tevis soils on south aspects: 0 to 5 percent

Areas of rock outcrop: 0 to 5 percent

## **Major Component Description**

### **Holloway**

*Surface layer texture:* Gravelly silt loam

*Depth class:* Very deep (more than 60 inches)

*Drainage class:* Somewhat excessively drained

*Dominant parent material:* Colluvium

*Native plant cover type:* Forest land

*Flooding:* None

*Available water capacity:* Mainly 3.4 inches

### **Rubble land**

*Definition:* Areas that have more than 90 percent of the surface covered by stones and boulders

*Dominant parent material:* Colluvium

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### **Management**

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Forest Land" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

### **Irvine Series**

Irvine series consists of very deep, well drained soils on dissected lake plains. These soils formed in varved, clayey lacustrine deposits. Slope is 4 to 60 percent. Elevation is 2,500 to 3,200 feet. The average annual precipitation is 12 to 16 inches, average annual air temperature is 39 to 45 degrees F, and the frost-free period is 105 to 120 days.

**Taxonomic Class:** Fine, illitic (calcareous), frigid Typic Xerorthents

## Typical Pedon

Irvine silty clay, 8 to 15 percent slopes, in an area of rangeland; approximately 900 feet north and 700 feet east of the southwest corner of sec. 17, T. 21 N., R. 21 W.

A--0 to 2 inches; light gray (10YR 7/1) silty clay, brown (10YR 5/3) moist; strong medium platy structure; slightly hard, friable, sticky and slightly plastic; many fine roots; many fine pores; slightly effervescent; mildly alkaline; abrupt smooth boundary.

C1--2 to 8 inches; very pale brown (10YR 7/3) silty clay, brown (10YR 5/3) moist; weak coarse subangular blocky structure; slightly hard, friable, sticky and plastic; many fine roots; many fine pores; strongly effervescent; moderately alkaline; gradual smooth boundary.

C2--8 to 14 inches; white (10YR 8/2) silty clay, pale brown (10YR 6/3) moist; massive; 1/4- to 3/4-inch weathered varves; hard, firm, sticky and slightly plastic; common fine roots; common fine pores; strongly effervescent; moderately alkaline; gradual smooth boundary.

C3--14 to 60 inches; white (10YR 8/2) silty clay, pale brown (10YR 6/3) moist; massive; 1/2- to 1-inch thick unweathered varves; hard, firm, sticky and slightly plastic; few fine roots; few fine pores; strongly effervescent; moderately alkaline.

## Range in Characteristics

*Soil temperature:* 42 to 47 degrees F

*Moisture control section:* Between 4 and 12 inches

*Control section:* 35 to 50 percent clay (dominantly illite) and less than 20 percent fine or coarser sand

*Content of rock fragments in the control section:* 0 to 15 percent

*Depth to varves:* Weathered 5 to 20, unweathered 10 to 30

### A horizon

Hue: 10YR or 2.5Y

Value: 5, 6, or 7 dry; 4 or 5 moist

Chroma: 1, 2, or 3

Texture: Silty clay or silty clay loam

Clay content: 35 to 50 percent

Content of rock fragments: 0 to 15 percent--0 to 10 percent cobbles, 0 to 5 percent pebbles

Reaction: pH 7.4 to 8.4

### C1 horizon

Hue: 10YR or 2.5Y

Value: 7 or 8 dry; 5, 6, or 7 moist

Chroma: 2 or 3

Texture: Silty clay or silty clay loam

Clay content: 35 to 50 percent

Content of rock fragments: 0 to 15 percent--0 to 10 percent cobbles, 0 to 5 percent pebbles

Sodium adsorption ratio: 8 to 13

Electrical conductivity: 1 to 4 mmhos/cm

Reaction: pH 7.4 to 8.4

### C2 horizon

Hue: 10YR or 2.5Y

Value: 7 or 8 dry; 5, 6, or 7 moist

Chroma: 2 or 3

Texture: Silty clay or silty clay loam

Clay content: 35 to 50 percent

Content of rock fragments: 0 to 15 percent--0 to 10 percent cobbles, 0 to 5 percent pebbles

Sodium adsorption ratio: 8 to 13

Electrical conductivity: 4 to 8 mmhos/cm

Reaction: pH 7.9 to 8.4

### C3 horizon

Hue: 10YR or 2.5Y

Value: 7 or 8 dry; 5, 6, or 7 moist

Chroma: 2 or 3

Texture: Silty clay or silty clay loam

Clay content: 35 to 50 percent

Content of rock fragments: 0 to 15 percent--0 to 10 percent cobbles, 0 to 5 percent pebbles

Sodium adsorption ratio: 8 to 13

Electrical conductivity: 4 to 8 mmhos/cm

Reaction: pH 7.9 to 9.0

## 79--Irvine silty clay, 8 to 15 percent slopes

### Setting

*Landform:* Lake plains

*Slope:* 8 to 15 percent

*Elevation:* 2,600 to 3,200 feet

*Mean annual precipitation:* 12 to 16 inches

*Frost-free period:* 105 to 120 days

### Composition

#### Major Components

Irvine and similar soils: 85 percent

#### Minor Components

Round Butte and similar soils: 0 to 5 percent

Areas of badland: 0 to 3 percent

Areas of steeper slopes: 0 to 5 percent  
Ronan soils in Charlo area: 0 to 2 percent

### Major Component Description

*Surface layer texture:* Silty clay  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Lacustrine deposits  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 5.5 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## 80--Irvine silty clay, 15 to 60 percent slopes

### Setting

*Landform:* Lake plains  
*Slope:* 15 to 60 percent  
*Elevation:* 2,600 to 3,200 feet  
*Mean annual precipitation:* 12 to 16 inches  
*Frost-free period:* 105 to 120 days

### Composition

#### Major Components

Irvine and similar soils: 85 percent

#### Minor Components

Round Butte and similar soils: 0 to 5 percent  
Vincom and similar soils: 0 to 5 percent  
Lonepine and similar soils: 0 to 2 percent  
Areas of badland: 0 to 3 percent

### Major Component Description

*Surface layer texture:* Silty clay loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Lacustrine deposits  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 5.7 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

### Jocko Series

Jocko series consists of very deep, somewhat excessively drained soils on outwash plains. These soils formed in glacial outwash. Slope is 0 to 15 percent. Elevation is 2,700 to 3,400 feet. The average annual precipitation is 15 to 19 inches, average annual air temperature is 41 to 45 degrees F, and the frost-free period is 105 to 120 days.

**Taxonomic Class:** Sandy-skeletal, mixed, frigid Calcic Haploxerolls

### Typical Pedon

Jocko gravelly loam, 0 to 4 percent slopes, in an area of cropland; 650 feet south and 1,300 feet west of the northeast corner of sec. 18, T. 16 N., R. 19 W.

Ap--0 to 6 inches; very dark grayish brown (10YR 3/2) gravelly loam, black (10YR 2/1) moist; moderate fine granular structure; soft, very

friable, slightly sticky and slightly plastic; many very fine and fine roots; few very fine tubular pores; 15 percent pebbles and 5 percent cobbles; neutral; clear smooth boundary.

A--6 to 13 inches; dark grayish brown (10YR 4/2) gravelly loam, very dark brown (10YR 2/2) moist; moderate medium subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots; common fine tubular pores; 15 percent pebbles and 5 percent cobbles; neutral; clear smooth boundary.

Bw1--13 to 19 inches; brown (10YR 4/3) very gravelly loam, dark brown (10YR 3/3) moist; moderate medium subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots; common very fine tubular pores; 30 percent pebbles and 15 percent cobbles; neutral; clear wavy boundary.

Bw2--19 to 25 inches; brown (10YR 5/3) very gravelly loamy sand, brown (10YR 4/3) moist; single grain; loose, nonsticky and nonplastic; common very fine and fine roots; 40 percent pebbles and 15 percent cobbles; mildly alkaline; clear wavy boundary.

Bk--25 to 60 inches; light brownish gray (10YR 6/2) extremely gravelly coarse sand, grayish brown (10YR 5/2) moist; single grain; loose, loose, nonsticky and nonplastic; few fine roots; 50 percent pebbles and 20 percent cobbles; few faint soft lime coatings and common prominent lime casts on undersides of pebbles; slightly effervescent; mildly alkaline.

### Range in Characteristics

*Soil temperature:* 43 to 47 degrees F  
*Moisture control section:* Between 12 and 35 inches  
*Mollic epipedon thickness:* 11 to 20 inches  
*Content of clay in the control section:* 5 to 15 percent  
*Depth to Bk horizon:* 20 to 29 inches  
*Depth to sand and gravel:* 18 to 24 inches

#### *Ap horizon*

Value: 3 or 4 dry; 2 or 3 moist  
 Chroma: 1 or 2  
 Texture: Loam or sandy loam  
 Clay content: 10 to 25 percent  
 Content of rock fragments: 5 to 35 percent--0 to 20 percent cobbles or stones, 5 to 25 percent pebbles  
 Reaction: pH 6.1 to 7.3

#### *A horizon*

Value: 3, 4, or 5 dry; 2 or 3 moist  
 Chroma: 2 or 3  
 Texture: Loam or sandy loam  
 Clay content: 10 to 25 percent  
 Content of rock fragments: 5 to 35 percent--0 to 20 percent cobbles or stones, 5 to 25 percent pebbles  
 Reaction: pH 6.1 to 7.3

#### *Bw1 horizon*

Value: 3, 4, or 5 dry; 2 or 3 moist  
 Chroma: 2 or 3  
 Texture: Loam or sandy loam  
 Clay content: 5 to 15 percent  
 Content of rock fragments: 35 to 60 percent--0 to 25 percent cobbles or stones, 25 to 45 percent pebbles  
 Reaction: pH 6.6 to 7.8

#### *Bw2 horizon*

Value: 5 or 6 dry; 4 or 5 moist  
 Chroma: 2 or 3  
 Texture: Sandy loam or loamy sand  
 Clay content: 0 to 5 percent  
 Content of rock fragments: 35 to 60 percent--10 to 25 percent cobbles or stones, 25 to 40 percent pebbles  
 Reaction: pH 6.6 to 7.8

#### *Bk horizon*

Value: 5, 6, or 7 dry; 4 or 5 moist  
 Chroma: 2 or 3  
 Texture: Loamy coarse sand, coarse sand, or sand  
 Clay content: 0 to 5 percent  
 Content of rock fragments: 60 to 85 percent--0 to 30 percent cobbles or stones, 45 to 70 percent pebbles  
 Calcium carbonate equivalent: 3 to 15 percent  
 Reaction: pH 6.6 to 7.8

## 81--Jocko gravelly loam, 0 to 4 percent slopes

### Setting

*Landform:* Outwash plains  
*Slope:* 0 to 4 percent  
*Elevation:* 2,700 to 3,300 feet  
*Mean annual precipitation:* 15 to 19 inches  
*Frost-free period:* 105 to 120 days

### Composition

#### Major Components

Jocko and similar soils: 85 percent

### Minor Components

Walstead and similar soils: 0 to 5 percent  
Lamoose and similar soils: 0 to 5 percent  
Jocko very gravelly loam: 0 to 5 percent

### Major Component Description

*Surface layer texture:* Gravelly loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Somewhat excessively drained  
*Dominant parent material:* Glacial outwash  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 3.3 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

### 82--Jocko gravelly loam, 4 to 15 percent slopes

#### Setting

*Landform:* Outwash plains  
*Slope:* 4 to 15 percent  
*Elevation:* 2,900 to 3,400 feet  
*Mean annual precipitation:* 15 to 19 inches  
*Frost-free period:* 105 to 120 days

#### Composition

##### Major Components

Jocko and similar soils: 85 percent

##### Minor Components

McCollum and similar soils: 0 to 6 percent  
Kerl and similar soils: 0 to 6 percent  
Jocko stony loam: 0 to 3 percent

### Major Component Description

*Surface layer texture:* Gravelly loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Somewhat excessively drained  
*Dominant parent material:* Glacial outwash  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 2.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

### 83--Jocko very stony sandy loam, 0 to 8 percent slopes

#### Setting

*Landform:* Outwash plains  
*Slope:* 0 to 8 percent  
*Elevation:* 3,200 to 3,400 feet  
*Mean annual precipitation:* 15 to 19 inches  
*Frost-free period:* 105 to 120 days

#### Composition

##### Major Components

Jocko and similar soils: 85 percent

##### Minor Components

McCollum and similar soils: 0 to 5 percent  
Kerl and similar soils: 0 to 5 percent  
Ninepipe and similar soils: 0 to 3 percent  
Steep slopes along escarpments: 0 to 2 percent

### Major Component Description

*Surface layer texture:* Very stony sandy loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Somewhat excessively drained

*Dominant parent material:* Glacial outwash  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 2.3 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

### Kerl Series

Kerl series consists of very deep, well drained soils on moraines, alluvial fans, stream terraces, and till plains. These soils formed in glaciofluvial and glaciolacustrine deposits and glacial till. Slope is 2 to 15 percent. Elevation is 2,800 to 3,600 feet. The average annual precipitation is 14 to 18 inches, average annual air temperature is 41 to 45 degrees F, and the frost-free period is 105 to 130 days.

**Taxonomic Class:** Fine-loamy, mixed, frigid Calcic Haploxerolls

### Typical Pedon

Kerl loam, 2 to 4 percent slopes, in an area of cropland; 500 feet south and 300 feet east of the northwest corner of sec. 24, T. 22 N., R. 21 W.

Ap--0 to 7 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure; soft, very friable, slightly sticky and slightly plastic; many fine roots; many fine pores; 5 percent pebbles; neutral; abrupt wavy boundary.

Bw1--7 to 14 inches; brown (10YR 5/3) loam, dark brown (10YR 3/3) moist; weak coarse prismatic structure; slightly hard, very friable, slightly sticky and slightly plastic; many fine

roots; many fine pores; 5 percent pebbles; neutral; clear irregular boundary.  
Bw2--14 to 20 inches; very pale brown (10YR 7/3) loam, brown (10YR 5/3) moist; moderate medium and coarse subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; common fine roots; common fine pores; 10 percent pebbles; neutral; clear wavy boundary.  
Bk--20 to 60 inches; light gray (10YR 7/2) loam, grayish brown (10YR 5/2) moist; weak coarse subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; few fine roots; few fine pores; 15 percent pebbles; common fine masses and threads of lime; violently effervescent; moderately alkaline.

### Range in Characteristics

*Soil temperature:* 43 to 47 degrees F

*Moisture control section:* Between 4 and 12 inches

*Mollic epipedon thickness:* 7 to 16 inches

*Control section:* 18 to 27 percent clay and 0 to 25 percent coarse fragments

*Depth to Bk horizon:* 14 to 26 inches

#### *Ap horizon*

Value: 4 or 5 dry; 2 or 3 moist

Chroma: 2 or 3

Texture: Silt loam or loam

Clay content: 18 to 27 percent

Content of rock fragments: 0 to 15 percent--0 to 5 percent cobbles, 0 to 10 percent pebbles

Reaction: pH 6.6 to 7.3

#### *Bw1 horizon*

Value: 5 or 6 dry; 3 or 4 moist

Chroma: 2 or 3

Texture: Loam or silt loam

Clay content: 18 to 27 percent

Content of rock fragments: 0 to 25 percent--0 to 5 percent cobbles, 0 to 20 percent pebbles

Reaction: pH 6.6 to 7.8

#### *Bw2 horizon*

Value: 5, 6, or 7 dry; 4 or 5 moist

Chroma: 3 or 4

Texture: Loam or silt loam

Clay content: 18 to 27 percent

Content of rock fragments: 0 to 25 percent--0 to 5 percent cobbles, 0 to 20 percent pebbles

Reaction: pH 6.6 to 8.4

#### *Bk horizon*

Value: 6 or 7 dry; 5 or 6 moist

Chroma: 2 or 3  
Texture: Loam, silt loam, or clay loam  
Clay content: 18 to 30 percent  
Content of rock fragments: 10 to 25 percent--0  
to 5 percent cobbles, 10 to 20 percent  
pebbles  
Calcium carbonate equivalent: 5 to 15 percent  
Reaction: pH 7.9 to 8.4

## 84--Kerl loam, 2 to 4 percent slopes

### Setting

*Landform:* Alluvial fans and stream terraces  
*Slope:* 2 to 4 percent  
*Elevation:* 2,800 to 3,300 feet  
*Mean annual precipitation:* 14 to 18 inches  
*Frost-free period:* 105 to 130 days

### Composition

#### Major Components

Kerl and similar soils: 85 percent

#### Minor Components

Polson and similar soils: 0 to 4 percent  
Belton and similar soils: 0 to 4 percent  
Gird and similar soils: 0 to 4 percent  
Niarada and similar soils: 0 to 3 percent

### Major Component Description

*Surface layer texture:* Loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Glaciofluvial deposits  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 10.6 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

\* "Range" section

- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## 85--Kerl loam, 4 to 8 percent slopes

### Setting

*Landform:* Alluvial fans and stream terraces  
*Slope:* 4 to 8 percent  
*Elevation:* 2,800 to 3,600 feet  
*Mean annual precipitation:* 14 to 18 inches  
*Frost-free period:* 105 to 130 days

### Composition

#### Major Components

Kerl and similar soils: 85 percent

#### Minor Components

Polson and similar soils: 0 to 4 percent  
Belton and similar soils: 0 to 4 percent  
Gird and similar soils: 0 to 4 percent  
Niarada and similar soils: 0 to 3 percent

### Major Component Description

*Surface layer texture:* Loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Glaciofluvial deposits  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 10.6 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## Kerrdam Series

Kerrdam series consists of very deep, well drained soils on lake plains. These soils formed in eolian deposits and relict stream terraces. Slope is 0 to 30 percent. Elevation is 2,700 to 3,000 feet. The average annual precipitation is 10 to 14 inches, average annual air temperature is 41 to 45 degrees F, and the frost-free period is 105 to 120 days.

**Taxonomic Class:** Coarse-silty, mixed, frigid Calcixerollic Xerochrepts

### Typical Pedon

Kerrdam silt loam, 0 to 2 percent slopes, in an area of cropland; 250 feet west and 30 feet north of the southeast corner of sec. 34, T. 22 N., R. 23 W.

Ap--0 to 5 inches; brown (10YR 5/3) silt loam, dark brown (10YR 3/3) moist; weak fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine and fine roots; few very fine tubular pores; neutral; abrupt smooth boundary.

Bw--5 to 12 inches; pale brown (10YR 6/3) silt loam, brown (10YR 5/3) moist; weak very coarse prismatic structure parting to weak coarse subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; many fine and medium roots; few very fine tubular pores; neutral; clear smooth boundary.

Bk--12 to 16 inches; light gray (10YR 7/2) silt loam, pale brown (10YR 6/3) moist; weak very coarse prismatic structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine and fine roots; many fine and medium tubular pores; disseminated lime and common medium masses of lime; violently effervescent; moderately alkaline; clear smooth boundary.

C1--16 to 34 inches; light gray (10YR 7/2) very fine sandy loam, pale brown (10YR 6/3) moist; massive; soft, very friable, nonsticky and nonplastic; common very fine roots; slightly effervescent; moderately alkaline; gradual smooth boundary.

C2--34 to 60 inches; light gray (10YR 7/2) silt loam, pale brown (10YR 6/3) moist; massive; soft, very friable, nonsticky and nonplastic; slightly effervescent; moderately alkaline.

### Range in Characteristics

*Soil temperature:* 43 to 46 degrees F

*Depth to Bk horizon:* 12 to 20 inches

*Other features:* Some pedons have 10 percent weakly cemented durinodes

### Ap horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 3 or 4 moist

Clay content: 5 to 15 percent

Reaction: pH 6.6 to 7.3

*Other features:* Where mixed to a depth of 7 inches the surface layer will not meet the color requirements for a mollic epipedon

### Bw horizon

Hue: 10YR or 2.5Y

Value: 6 or 7 dry; 5 or 6 moist

Chroma: 3 or 4

Texture: Silt loam or very fine sandy loam

Clay content: 5 to 15 percent

Reaction: pH 6.6 to 7.8

### Bk horizon

Hue: 10YR or 2.5Y

Value: 7 or 8 dry; 5, 6, or 7 moist

Chroma: 2, 3, or 4

Texture: Very fine sandy loam or silt loam

Clay content: 5 to 15 percent

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.4 to 8.4

### C1 horizon

Hue: 10YR or 2.5Y

Value: 7 or 8 dry; 6 or 7 moist

Chroma: 2, 3, or 4

Texture: Silt loam or very fine sandy loam

Clay content: 0 to 5 percent

Reaction: pH 7.4 to 8.4

### C2 horizon

Hue: 10YR or 2.5Y

Value: 7 or 8 dry; 6 or 7 moist

Chroma: 2, 3, or 4

Texture: Silt loam, very fine sandy loam, or loamy very fine sand

Clay content: 0 to 5 percent

Sodium adsorption ratio: 13 to 20

Reaction: pH 7.4 to 8.4

## 86--Kerrdam silt loam, 0 to 2 percent slopes

### Setting

*Landform:* Lake plains

*Slope:* 0 to 2 percent

*Elevation:* 2,700 to 3,000 feet

*Mean annual precipitation:* 10 to 14 inches

*Frost-free period:* 105 to 120 days

## Composition

### Major Components

Kerrdam and similar soils: 90 percent

### Minor Components

Dryfork and similar soils: 0 to 10 percent

## Major Component Description

*Surface layer texture:* Silt loam

*Depth class:* Very deep (more than 60 inches)

*Drainage class:* Well drained

*Dominant parent material:* Eolian deposits

*Native plant cover type:* Rangeland

*Flooding:* None

*Available water capacity:* Mainly 10.7 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

## Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## 87--Kerrdam silt loam, 2 to 6 percent slopes

### Setting

*Landform:* Lake plains

*Slope:* 2 to 6 percent

*Elevation:* 2,700 to 3,000 feet

*Mean annual precipitation:* 10 to 14 inches

*Frost-free period:* 105 to 120 days

## Composition

### Major Components

Kerrdam and similar soils: 90 percent

### Minor Components

Dryfork and similar soils: 0 to 10 percent

## Major Component Description

*Surface layer texture:* Silt loam

*Depth class:* Very deep (more than 60 inches)

*Drainage class:* Well drained

*Dominant parent material:* Eolian deposits

*Native plant cover type:* Rangeland

*Flooding:* None

*Available water capacity:* Mainly 10.7 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

## Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## 88--Kerrdam-Vincom silt loams, 6 to 15 percent slopes

### Setting

*Landform:*

\* Kerrdam--Relict stream terraces

\* Vincom--Relict stream terraces

*Position on landform:*

\* Kerrdam--Shoulders and summits

\* Vincom--Foot slopes

*Slope:*

\* Kerrdam--6 to 15 percent

\* Vincom--6 to 15 percent

*Elevation:* 2,700 to 3,000 feet

*Mean annual precipitation:* 12 to 14 inches

*Frost-free period:* 105 to 120 days

## Composition

### Major Components

Kerrdam and similar soils: 65 percent

Vincom and similar soils: 25 percent

### Minor Components

Dryfork and similar soils: 0 to 5 percent

Selow and similar soils: 0 to 5 percent

## Major Component Description

### Kerrdam

*Surface layer texture:* Silt loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Eolian deposits  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 10.7 inches

### Vincom

*Surface layer texture:* Silt loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Lacustrine deposits  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Sodium affected:* Sodic within 30 inches  
*Available water capacity:* Mainly 9.0 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

## Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## 89--Kerrdam-Vincom silt loams, 15 to 30 percent slopes

### Setting

#### *Landform:*

- \* Kerrdam--Relict stream terraces
- \* Vincom--Relict stream terraces

#### *Position on landform:*

- \* Kerrdam--Shoulders and summits
- \* Vincom--Foot slopes

#### *Slope:*

- \* Kerrdam--15 to 30 percent

\* Vincom--15 to 30 percent  
*Elevation:* 2,700 to 3,000 feet  
*Mean annual precipitation:* 12 to 14 inches  
*Frost-free period:* 105 to 120 days

## Composition

### Major Components

Kerrdam and similar soils: 55 percent  
Vincom and similar soils: 35 percent

### Minor Components

Dryfork and similar soils: 0 to 5 percent  
Selow and similar soils: 0 to 5 percent

## Major Component Description

### Kerrdam

*Surface layer texture:* Silt loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Eolian deposits  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 10.7 inches

### Vincom

*Surface layer texture:* Silt loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Lacustrine deposits  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Sodium affected:* Sodic within 30 inches  
*Available water capacity:* Mainly 9.0 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

## Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## Kingspoint Series

Kingspoint series consists of very deep, well drained soils on moraines and mountains. These soils formed in alpine till. Slope is 4 to 60 percent. Elevation is 2,900 to 4,600 feet. The average annual precipitation is 18 to 25 inches, average annual air temperature is 40 to 45 degrees F, and the frost-free period is 90 to 105 days.

**Taxonomic Class:** Loamy-skeletal, mixed, frigid Typic Ustochrepts

### Typical Pedon

Kingspoint very gravelly loam, 15 to 30 percent slopes, in an area of woodland; 1,100 feet north and 2,600 feet east of the southwest corner of sec. 6, T. 25 N., R. 20 W.

Oi--3 to 2 inches; undecomposed needles and twigs.

Oe--2 inches to 0; partially decomposed forest litter.

E--0 to 4 inches; light gray (10YR 7/2) very gravelly loam, grayish brown (10YR 5/2) moist; weak medium granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots and common medium and coarse roots; 35 percent pebbles; neutral; abrupt wavy boundary.

EB--4 to 11 inches; light gray (10YR 7/2) very gravelly loam, grayish brown (10YR 5/2) moist; weak medium subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; common roots; common fine and medium tubular pores; 40 percent pebbles; neutral; clear wavy boundary.

Bw--11 to 22 inches; light brownish gray (10YR 6/2) very gravelly loam, grayish brown (10YR 5/2) moist; weak medium subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; common very fine, fine, and medium roots and few coarse roots; common fine pores and few medium pores; 10 percent cobbles and 40 percent pebbles; neutral; clear wavy boundary.

Bk1--22 to 31 inches; light gray (10YR 7/2) very gravelly loam, pale brown (10YR 6/3) moist; massive; soft, very friable, slightly sticky and slightly plastic; common fine and medium roots and few coarse roots; few fine pores and medium pores; 5 percent stones, 5 percent cobbles, and 40 percent pebbles; disseminated lime; strongly effervescent; mildly alkaline; clear wavy boundary.

Bk2--31 to 60 inches; light gray (10YR 7/2) very gravelly loam, pale brown (10YR 5/2) moist; massive; soft, very friable, slightly sticky and slightly plastic; common fine and medium roots; few fine pores; 5 percent cobbles and 35 percent pebbles; disseminated lime; violently effervescent; moderately alkaline.

### Range in Characteristics

*Soil temperature:* 42 to 47 degrees F

*Moisture control section:* Between 4 and 12 inches

*Control section:* 15 to 27 percent clay and 35 to 60 percent rock fragments

*Depth to Bk horizon:* 15 to 28 inches

#### *E, EB horizons*

Value: 6 or 7 dry; 5 or 6 moist

Chroma: 2 or 3

Clay content: 15 to 27 percent

Content of rock fragments: 15 to 60 percent--0 to 15 percent cobbles and stones, 15 to 45 percent pebbles

Reaction: pH 6.6 to 7.3

#### *Bw horizon*

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Loam or silt loam

Clay content: 15 to 27 percent

Content of rock fragments: 35 to 60 percent--0 to 15 percent cobbles and stones, 35 to 45 percent pebbles

Reaction: pH 6.6 to 7.3

#### *Bk1 horizon*

Value: 6 or 7 dry; 5 or 6 moist

Chroma: 2 or 3

Texture: Loam or silt loam

Clay content: 15 to 27 percent

Content of rock fragments: 35 to 60 percent--0 to 15 percent cobbles and stones, 35 to 45 percent pebbles

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.4 to 8.4

#### *Bk2 horizon*

Value: 7 or 8 dry; 5 or 6 moist

Chroma: 2 or 3

Texture: Loam or silt loam

Clay content: 15 to 27 percent

Content of rock fragments: 35 to 60 percent--0 to 15 percent cobbles and stones, 30 to 45 percent pebbles

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.9 to 8.4

## 90--Kingspoint gravelly loam, 4 to 15 percent slopes

### Setting

*Landform:* Moraines  
*Slope:* 4 to 15 percent  
*Elevation:* 2,900 to 4,600 feet  
*Mean annual precipitation:* 18 to 25 inches  
*Frost-free period:* 90 to 105 days

### Composition

#### Major Components

Kingspoint and similar soils: 85 percent

#### Minor Components

Eaglewing and similar soils: 0 to 3 percent  
McDonald and similar soils: 0 to 3 percent  
Winkler and similar soils: 0 to 3 percent  
Kingspoint stony or bouldery: 0 to 2 percent  
Poorly drained soils: 0 to 2 percent  
Somewhat poorly drained soils: 0 to 2 percent

### Major Component Description

*Surface layer texture:* Gravelly loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Alpine till  
*Native plant cover type:* Forest land  
*Flooding:* None  
*Available water capacity:* Mainly 6.6 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Forest Land" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## 91--Kingspoint very gravelly loam, 15 to 30 percent slopes

### Setting

*Landform:* Mountains  
*Slope:* 15 to 30 percent  
*Elevation:* 2,900 to 4,600 feet  
*Mean annual precipitation:* 18 to 25 inches  
*Frost-free period:* 90 to 105 days

### Composition

#### Major Components

Kingspoint and similar soils: 85 percent

#### Minor Components

Eaglewing and similar soils: 0 to 3 percent  
McDonald and similar soils: 0 to 3 percent  
Winkler and similar soils: 0 to 3 percent  
Kingspoint stony or bouldery: 0 to 2 percent

### Major Component Description

*Surface layer texture:* Very gravelly loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Alpine till  
*Native plant cover type:* Forest land  
*Flooding:* None  
*Available water capacity:* Mainly 6.0 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Forest Land" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## 92--Kingspoint very gravelly loam, 30 to 60 percent slopes

### Setting

*Landform:* Mountains

*Slope:* 30 to 60 percent

*Elevation:* 2,900 to 4,600 feet

*Mean annual precipitation:* 18 to 25 inches

*Frost-free period:* 90 to 105 days

### Composition

#### Major Components

Kingspoint and similar soils: 85 percent

#### Minor Components

More moist north aspects: 0 to 5 percent

Repp and similar soils: 0 to 5 percent

Areas of rock outcrop: 0 to 5 percent

### Major Component Description

*Surface layer texture:* Very gravelly loam

*Depth class:* Very deep (more than 60 inches)

*Drainage class:* Well drained

*Dominant parent material:* Alpine till

*Native plant cover type:* Forest land

*Flooding:* None

*Available water capacity:* Mainly 6.0 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Forest Land" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

### Lamoose Series

Lamoose series consists of very deep, poorly drained soils on floodplains. These soils formed in alluvium. Slope is 0 to 2 percent. Elevation is

2,700 to 3,200 feet. The average annual precipitation is 14 to 18 inches, average annual air temperature is 41 to 45 degrees F, and the frost-free period is 105 to 120 days.

**Taxonomic Class:** Fine-loamy over sandy or sandy-skeletal, mixed (calcareous), frigid Typic Haplaquolls

### Typical Pedon

Lamoose loam, 0 to 2 percent slopes, in an area of cropland; 2,350 feet east and 2,400 feet north of the southwest corner of sec. 21, T. 17 N., R. 20 W.

Ap--0 to 7 inches; dark gray (10YR 4/1) loam, black (10YR 2/1) moist; weak fine granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots; many very fine and fine pores; disseminated lime; strongly effervescent; moderately alkaline; abrupt smooth boundary.

Bg--7 to 19 inches; light gray (10YR 7/1) loam, dark gray (10YR 4/1) moist; common medium gray (10YR 5/1) and dark yellowish brown (10YR 4/4) mottles; weak coarse prismatic structure; slightly hard, very friable, slightly sticky and slightly plastic; common fine and very fine roots; common fine and very fine pores; disseminated lime; strongly effervescent; neutral; abrupt wavy boundary.

2C--19 to 60 inches; gray (10YR 6/1) very gravelly sand, dark grayish brown (10YR 4/2) moist; single grain; loose, nonsticky and nonplastic; few fine roots; few fine pores; 50 percent pebbles; disseminated lime; slightly effervescent; neutral.

### Range in Characteristics

*Soil temperature:* 43 to 47 degrees F

*Moisture control section:* Between 4 and 12 inches

*Mollic epipedon thickness:* 7 to 12 inches

*Depth to 2C horizon:* 14 to 24 inches

*Depth to water table:* 0 to 12 inches

*Ap horizon*

Value: 4 or 5 dry; 2 or 3 moist

Chroma: 1 or 2

Clay content: 18 to 27 percent

Content of rock fragments: 0 to 35 percent pebbles

Reaction: pH 7.4 to 8.4

### *Bg horizon*

Value: 6 or 7 dry, 4 or 5 moist; mottles--4, 5, or 6 dry, 4, 5, or 6 moist

Chroma: 1 or 2; mottles--1, 4, or 6

Texture: Loam or silt loam

Clay content: 18 to 27 percent

Content of rock fragments: 0 to 35 percent pebbles

Reaction: pH 6.6 to 7.8

Other features: Some pedons have a Cg horizon

### *2C horizon*

Value: 6 or 7 dry; 4 or 5 moist

Chroma: 1 or 2

Texture: Loamy sand or sand

Clay content: 0 to 10 percent

Content of rock fragments: 35 to 70 percent--0 to 15 percent cobbles, 35 to 55 percent pebbles

Reaction: pH 6.6 to 7.8

Other features: Some pedons have a gravelly sandy loam transition horizon above the 2C horizon that is less than 5 inches thick

## **93--Lamoose loam, 0 to 2 percent slopes**

### **Setting**

*Landform:* Flood plains

*Slope:* 0 to 2 percent

*Elevation:* 2,700 to 3,200 feet

*Mean annual precipitation:* 14 to 18 inches

*Frost-free period:* 105 to 120 days

### **Composition**

#### **Major Components**

Lamoose and similar soils: 85 percent

#### **Minor Components**

Jocko gravelly loam soils: 0 to 5 percent

Areas that frequently flood: 0 to 5 percent

Areas that rarely flood: 0 to 5 percent

### **Major Component Description**

*Surface layer texture:* Loam

*Depth class:* Very deep (more than 60 inches)

*Drainage class:* Poorly drained

*Dominant parent material:* Alluvium

*Flooding:* Occasional

*Water table:* Apparent

*Available water capacity:* Mainly 4.3 inches

A typical soil description with range in characteristics is included, in alphabetical order, in

this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### **Management**

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

### **Lonepine Series**

Lonepine series consists of very deep, well drained soils on lake plains. These soils formed in lacustrine deposits. Slope is 0 to 15 percent. Elevation is 2,600 to 3,200 feet. The average annual precipitation is 10 to 14 inches, average annual air temperature is 40 to 45 degrees F, and the frost-free period is 105 to 120 days.

**Taxonomic Class:** Fine-silty, mixed, frigid Calcixerollic Xerochrepts

### **Typical Pedon**

Lonepine silt loam, 2 to 4 percent slopes, in an area of cropland; approximately 2,600 feet west and 100 feet south of the northeast corner of sec. 25, T. 21 N., R. 21 W.

Ap--0 to 6 inches; light brownish gray (10YR 6/2) silt loam, dark grayish brown (10YR 4/2) moist; weak fine granular structure; slightly hard, very friable, slightly sticky and nonplastic; common very fine roots; few very fine pores; neutral; abrupt wavy boundary.

Bw--6 to 14 inches; pale brown (10YR 6/3) silt loam, brown (10YR 4/3) moist; weak coarse subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; common very fine roots; common very fine tubular pores; neutral; abrupt irregular boundary.

Bk--14 to 19 inches; white (10YR 8/2) silt loam, brown (10YR 5/3) moist; moderate medium platy structure; hard, very friable, slightly sticky and slightly plastic; few fine roots; few very fine tubular pores; disseminated lime and common medium soft masses of lime; strongly

effervescent; moderately alkaline; gradual irregular boundary.  
C--19 to 60 inches; white (10YR 8/2) silt loam, pale brown (10YR 6/3) moist; moderate medium platy varves 1/4 to 1/2 inch thick; hard, very friable, slightly sticky and slightly plastic; strongly effervescent; moderately alkaline.

### Range in Characteristics

*Soil temperature:* 42 to 47 degrees F  
*Moisture control section:* Between 4 and 12 inches  
*Content of clay in the control section:* 18 to 35 percent  
*Depth to Bk horizon:* 11 to 20 inches  
*Depth to varves:* 18 to 40 inches

#### *Ap horizon*

Hue: 10YR or 2.5Y  
Value: 5 or 6 dry; 4 or 5 moist  
Chroma: 2 or 3  
Clay content: 12 to 25 percent  
Reaction: pH 6.6 to 7.3

#### *Bw horizon*

Hue: 10YR or 2.5Y  
Value: 5 or 6 dry; 4 or 5 moist  
Chroma: 2 or 3  
Texture: Silt loam or silty clay loam  
Clay content: 18 to 35 percent  
Reaction: pH 6.6 to 7.3

#### *Bk horizon*

Hue: 10YR or 2.5Y  
Value: 6, 7, or 8 dry; 5 or 6 moist  
Chroma: 2 or 3  
Texture: Silt loam or silty clay loam  
Clay content: 18 to 35 percent  
Calcium carbonate equivalent: 10 to 15 percent  
Reaction: pH 7.9 to 8.4

#### *C horizon*

Hue: 10YR or 2.5Y  
Value: 6, 7, or 8 dry; 5 or 6 moist  
Chroma: 2 or 3  
Texture: Silt loam or silty clay loam  
Clay content: 18 to 35 percent  
Reaction: pH 7.9 to 8.4

### 94--Lonepine silt loam, 0 to 2 percent slopes

#### Setting

*Landform:* Lake plains

*Slope:* 0 to 2 percent  
*Elevation:* 2,600 to 3,000 feet  
*Mean annual precipitation:* 10 to 14 inches  
*Frost-free period:* 105 to 120 days

### Composition

#### Major Components

Lonepine and similar soils: 90 percent

#### Minor Components

Selow and similar soils: 0 to 10 percent

### Major Component Description

*Surface layer texture:* Silt loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Lacustrine deposits  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 10.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

### 95--Lonepine silt loam, 2 to 4 percent slopes

#### Setting

*Landform:* Lake plains  
*Slope:* 2 to 4 percent  
*Elevation:* 2,600 to 3,000 feet  
*Mean annual precipitation:* 10 to 14 inches  
*Frost-free period:* 105 to 120 days

## Composition

### Major Components

Lonepine and similar soils: 85 percent

### Minor Components

Kerl and similar soils: 0 to 5 percent

Round Butte and similar soils: 0 to 5 percent

Vincom and similar soils: 0 to 5 percent

## Major Component Description

*Surface layer texture:* Silt loam

*Depth class:* Very deep (more than 60 inches)

*Drainage class:* Well drained

*Dominant parent material:* Lacustrine deposits

*Native plant cover type:* Rangeland

*Flooding:* None

*Available water capacity:* Mainly 10.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

## Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## 96--Lonepine silt loam, dry, 2 to 8 percent slopes

### Setting

*Landform:* Lake plains

*Slope:* 2 to 8 percent

*Elevation:* 2,600 to 3,000 feet

*Mean annual precipitation:* 10 to 14 inches

*Frost-free period:* 105 to 120 days

## Composition

### Major Components

Lonepine and similar soils: 90 percent

### Minor Components

Selow and similar soils: 0 to 10 percent

## Major Component Description

*Surface layer texture:* Silt loam

*Depth class:* Very deep (more than 60 inches)

*Drainage class:* Well drained

*Dominant parent material:* Lacustrine deposits

*Native plant cover type:* Rangeland

*Flooding:* None

*Available water capacity:* Mainly 10.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

## Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## 97--Lonepine-Vincom silt loams, 4 to 8 percent slopes

### Setting

*Landform:*

\* Lonepine--Lake plains

\* Vincom--Lake plains

*Position on landform:*

\* Lonepine--Foot slopes

\* Vincom--Back slopes and shoulders

*Slope:*

\* Lonepine--4 to 8 percent

\* Vincom--4 to 8 percent

*Elevation:* 2,600 to 3,200 feet

*Mean annual precipitation:* 12 to 14 inches

*Frost-free period:* 105 to 120 days

## Composition

### Major Components

Lonepine and similar soils: 55 percent

Vincom and similar soils: 35 percent

### Minor Components

Kerl and similar soils: 0 to 5 percent

Esteslake and similar soils: 0 to 5 percent

## Major Component Description

### Lonepine

*Surface layer texture:* Silt loam

*Depth class:* Very deep (more than 60 inches)

*Drainage class:* Well drained

*Dominant parent material:* Lacustrine deposits

*Native plant cover type:* Rangeland

*Flooding:* None

*Available water capacity:* Mainly 10.8 inches

### Vincom

*Surface layer texture:* Silt loam

*Depth class:* Very deep (more than 60 inches)

*Drainage class:* Well drained

*Dominant parent material:* Lacustrine deposits

*Native plant cover type:* Rangeland

*Flooding:* None

*Sodium affected:* Sodic within 30 inches

*Available water capacity:* Mainly 9.0 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

## Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## 98--Lonepine-Vincom silt loams, dry, 4 to 15 percent slopes

### Setting

#### *Landform:*

- \* Lonepine--Lake plains
- \* Vincom--Lake plains

#### *Position on landform:*

- \* Lonepine--Foot slopes
- \* Vincom--Back slopes and shoulders

#### *Slope:*

- \* Lonepine--4 to 15 percent
- \* Vincom--4 to 15 percent

*Elevation:* 2,600 to 3,000 feet

*Mean annual precipitation:* 12 to 14 inches  
*Frost-free period:* 105 to 120 days

## Composition

### Major Components

Lonepine and similar soils: 55 percent

Vincom and similar soils: 35 percent

### Minor Components

Whitearth and similar soils: 0 to 10 percent

## Major Component Description

### Lonepine

*Surface layer texture:* Silt loam

*Depth class:* Very deep (more than 60 inches)

*Drainage class:* Well drained

*Dominant parent material:* Lacustrine deposits

*Native plant cover type:* Rangeland

*Flooding:* None

*Available water capacity:* Mainly 10.8 inches

### Vincom

*Surface layer texture:* Silt loam

*Depth class:* Very deep (more than 60 inches)

*Drainage class:* Well drained

*Dominant parent material:* Lacustrine deposits

*Native plant cover type:* Rangeland

*Flooding:* None

*Sodium affected:* Sodic within 30 inches

*Available water capacity:* Mainly 9.0 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

## Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## Marklepass Series

Marklepass series consists of very deep, well drained, sodium-affected soils on alluvial fans and

stream terraces. These soils formed in clayey alluvium. Slope is 0 to 2 percent. Elevation is 2,700 to 2,800 feet. The average annual precipitation is 10 to 14 inches, average annual air temperature is 41 to 45 degrees F, and the frost-free period is 105 to 120 days.

**Taxonomic Class:** Fine, mixed, frigid Typic Natrixeralfs

### Typical Pedon

Marklepass silty clay loam, 0 to 2 percent slopes, in an area of range; 1,400 feet north and 700 feet east of the southwest corner of sec. 28, T. 22 N., R. 23 W.

Ap1--0 to 4 inches; light gray (10YR 7/2) silty clay loam, dark grayish brown (10YR 4/2) moist; moderate coarse platy structure parting to weak fine granular; slightly hard, very friable, slightly sticky and slightly plastic; many very fine roots and common fine roots; many fine vesicular pores and common very fine vesicular pores; strongly alkaline; abrupt smooth boundary.

Ap2--4 to 9 inches; light gray (10YR 7/2) silty clay loam, dark grayish brown (10YR 4/2) moist; moderate medium subangular blocky structure parting to weak medium granular; slightly hard, very friable, slightly sticky and slightly plastic; many very fine roots and common fine roots; common fine discontinuous tubular pores and few very fine and medium discontinuous tubular pores; strongly alkaline; clear wavy boundary.

Btn/E--9 to 14 inches; 60 percent is very pale brown (10YR 7/3) and brown (10YR 4/3) moist (B part); 40 percent is light gray (10YR 7/2) and grayish brown (10YR 5/2) moist (E part); silty clay loam; strong coarse columnar structure parting to moderate medium subangular blocky; slightly hard, friable, sticky and plastic; common very fine and fine roots; few very fine continuous tubular pores and common fine and medium continuous tubular pores; common prominent clay films on faces of peds; common faint organic stains on faces of peds; strongly alkaline; clear irregular boundary.

Btn--14 to 20 inches; pale brown (10YR 6/3) and very pale brown (10YR 7/3) crushed, brown (10YR 5/3) and yellowish brown (10YR 5/4) crushed, moist; silty clay loam; moderate coarse prismatic structure parting to strong medium angular blocky; hard, firm, very sticky

and very plastic; few medium roots and common very fine and fine roots; few very fine and medium tubular pores; continuous distinct gray (10YR 5/1) organic stains on faces of peds and in pores; distinct continuous clay films on faces of peds and in pores; very strongly alkaline; abrupt smooth boundary. Bkn--20 to 34 inches; very pale brown (10YR 8/3) silty clay loam, pale brown (10YR 6/3) moist; massive; slightly hard, friable, sticky and plastic; few very fine and fine roots; few fine threads of lime; violently effervescent; very strongly alkaline; gradual wavy boundary. BCn--34 to 60 inches; very pale brown (10YR 8/3) silty clay loam, pale brown (10YR 6/3) moist; massive; very hard, firm, sticky and plastic; slightly effervescent; very strongly alkaline; gradual wavy boundary.

### Range in Characteristics

*Soil temperature:* 43 to 47 degrees F

*Moisture control section:* Between 4 and 12 inches

*Content of clay in the control section:* 35 to 50 percent

*Depth to Bk horizon:* 10 to 25 inches

*Other features:* Some pedons have an E/Bt horizon or an E horizon

#### *Ap horizon*

Hue: 10YR or 2.5Y

Value: 5, 6, 7, or 8 dry; 4, 5, or 6 moist

Chroma: 2 or 3

Clay content: 27 to 40 percent

Electrical conductivity: Less than 4 mmhos/cm

Sodium adsorption ratio: 13 to 75

Reaction: pH 8.4 to 9.6

#### *Btn/E horizon*

Hue: 10YR or 2.5Y

Value: B part--6 or 7 dry and 4 or 5 moist; E part--7 or 8 dry and 5 or 6 moist

Chroma: B part--3 or 4; E part--2 or 3

Clay content: 27 to 40 percent

Electrical conductivity: Less than 4 mmhos/cm

Sodium adsorption ratio: 45 to 75

Reaction: pH 8.4 to 9.6

#### *Btn horizon*

Hue: 10YR or 2.5Y

Value: 6 or 7 dry; 4, 5, or 6 moist

Chroma: 2, 3, or 4

Texture: Silty clay loam or silty clay

Clay content: 35 to 50 percent

Electrical conductivity: Less than 4 mmhos/cm

Sodium adsorption ratio: 45 to 120

Reaction: pH 8.4 to 9.6

*Bkn horizon*

Hue: 10YR or 2.5Y  
Value: 6, 7, or 8 dry; 5, 6, or 7 moist  
Chroma: 2, 3, or 4  
Texture: Silty clay loam or silty clay  
Clay content: 30 to 50 percent  
Electrical conductivity: 2 to 8 mmhos/cm  
Sodium adsorption ratio: 45 to 120  
Calcium carbonate equivalent: 5 to 10 percent  
Reaction: pH 8.4 to 9.6

*BCn horizon*

Hue: 10YR or 2.5Y  
Value: 7 or 8 dry; 5, 6, or 7 moist  
Chroma: 2, 3, or 4  
Texture: Silty clay loam or silty clay  
Clay content: 30 to 50 percent  
Electrical conductivity: Less than 2 mmhos/cm  
Sodium adsorption ratio: 13 to 100  
Reaction: pH 8.4 to 9.6

**99--Marklepass silty clay loam, 0 to 2 percent slopes**

**Setting**

*Landform:* Alluvial fans and stream terraces  
*Slope:* 0 to 2 percent  
*Elevation:* 2,700 to 2,800 feet  
*Mean annual precipitation:* 10 to 14 inches  
*Frost-free period:* 105 to 120 days

**Composition**

**Major Components**

Marklepass and similar soils: 85 percent

**Minor Components**

Whitearth and similar soils: 0 to 10 percent  
Round Butte and similar soils: 0 to 5 percent

**Major Component Description**

*Surface layer texture:* Silty clay loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Alluvium  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Sodium affected:* Sodic within 30 inches  
*Available water capacity:* Mainly 4.9 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is

available in the "Soil Properties" section, Part II, of this publication.

**Management**

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

**100--Marklepass-Slickspots complex, 0 to 2 percent slopes**

**Setting**

*Landform:*

- \* Marklepass--Alluvial fans and stream terraces
- \* Slickspots--Alluvial fans and stream terraces

*Slope:*

- \* Marklepass--0 to 2 percent
- \* Slickspots--0 to 2 percent

*Elevation:* 2,700 to 2,800 feet

*Mean annual precipitation:* 10 to 14 inches

*Frost-free period:* 105 to 120 days

**Composition**

**Major Components**

Marklepass and similar soils: 60 percent  
Slickspots: 30 percent

**Minor Components**

Bolack and similar soils: 0 to 10 percent

**Major Component Description**

**Marklepass**

*Surface layer texture:* Silty clay loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Alluvium  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Sodium affected:* Sodic within 30 inches  
*Available water capacity:* Mainly 4.9 inches

**Slickspots**

*Definition:* A small area of soil having a puddled, crusted or smooth surface and an excess of exchangeable sodium. The soil is slippery when wet and very low in productivity.

*Dominant parent material:* Glaciolacustrine deposits

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

### McCullum Series

McCullum series consists of very deep, well drained soils on alluvial fans and stream terraces in intermountain valleys. These soils formed in alluvium. Slope is 0 to 8 percent. Elevation is 2,500 to 3,300 feet. The average annual precipitation is about 14 to 18 inches, average annual air temperature is 40 to 45 degrees F, and the frost-free period is 105 to 120 days.

**Taxonomic Class:** Coarse-loamy, mixed, frigid Typic Haploxerolls

### Typical Pedon

McCullum fine sandy loam, 2 to 4 percent slopes, in an area of cropland; approximately 180 feet south and 400 feet east of the northwest corner of sec. 25, T. 22 N., R. 20 W.

Ap--0 to 7 inches; grayish brown (10YR 5/2) fine sandy loam, very dark brown (10YR 2/2) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; many fine roots; many fine pores; neutral; clear smooth boundary.

Bw1--7 to 17 inches; brown (10YR 5/3) fine sandy loam, dark brown (10YR 3/3) moist; weak medium and coarse subangular blocky

structure; soft, very friable, nonsticky and nonplastic; common fine roots; common fine pores; neutral; gradual wavy boundary.  
Bw2--17 to 29 inches; pale brown (10YR 6/3) fine sandy loam, brown (10YR 4/3) moist; weak coarse subangular blocky structure; soft, very friable, nonsticky and nonplastic; common fine roots; common fine pores; neutral; gradual wavy boundary.  
Bw3--29 to 60 inches; very pale brown (10YR 7/3) fine sandy loam, brown (10YR 5/3) moist; weak coarse subangular blocky structure; soft, very friable, nonsticky and nonplastic; few fine roots; few fine pores; neutral.

### Range in Characteristics

*Soil temperature:* 42 to 47 degrees F

*Moisture control section:* Between 8 and 24 inches

*Mollic epipedon thickness:* 10 to 20 inches

*Control section:* 8 to 18 percent clay and less than 35 percent fine and coarser sand

#### Ap horizon

Hue: 10YR or 2.5Y

Value: 4 or 5 dry; 2 or 3 moist

Chroma: 2 or 3

Clay content: 8 to 18 percent

Reaction: pH 6.1 to 7.3

#### Bw1 horizon

Hue: 10YR or 2.5Y

Value: 4 or 5 dry; 2 or 3 moist

Chroma: 2 or 3

Clay content: 8 to 18 percent

Reaction: pH 6.1 to 7.3

#### Bw2 horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Clay content: 8 to 18 percent

Reaction: pH 6.1 to 7.3

#### Bw3 horizon

Hue: 10YR or 2.5Y

Value: 6 or 7 dry; 5 or 6 moist

Chroma: 2 or 3

Texture: Fine sandy loam, sandy loam, or loamy fine sand

Clay content: 5 to 15 percent

Content of rock fragments: 0 to 60 percent pebbles

Reaction: pH 6.6 to 7.8

## 101--McCullum fine sandy loam, 0 to 2 percent slopes

### Setting

*Landform:* Alluvial fans and stream terraces  
*Slope:* 0 to 2 percent  
*Elevation:* 2,500 to 3,300 feet  
*Mean annual precipitation:* 14 to 18 inches  
*Frost-free period:* 105 to 120 days

### Composition

#### Major Components

McCullum and similar soils: 85 percent

#### Minor Components

Gird and similar soils: 0 to 10 percent  
Selon and similar soils: 0 to 5 percent

### Major Component Description

*Surface layer texture:* Fine sandy loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Alluvium  
*Flooding:* None  
*Available water capacity:* Mainly 7.9 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## 102--McCullum fine sandy loam, 2 to 4 percent slopes

### Setting

*Landform:* Alluvial fans and stream terraces  
*Slope:* 2 to 4 percent  
*Elevation:* 2,500 to 3,300 feet  
*Mean annual precipitation:* 14 to 18 inches

*Frost-free period:* 105 to 120 days

### Composition

#### Major Components

McCullum and similar soils: 85 percent

#### Minor Components

Gird and similar soils: 0 to 10 percent  
Sacheen and similar soils: 0 to 5 percent

### Major Component Description

*Surface layer texture:* Fine sandy loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Alluvium  
*Flooding:* None  
*Available water capacity:* Mainly 7.9 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## 103--McCullum fine sandy loam, 4 to 8 percent slopes

### Setting

*Landform:* Alluvial fans and stream terraces  
*Slope:* 4 to 8 percent  
*Elevation:* 2,500 to 3,300 feet  
*Mean annual precipitation:* 14 to 18 inches  
*Frost-free period:* 105 to 120 days

### Composition

#### Major Components

McCullum and similar soils: 90 percent

#### Minor Components

Gird and similar soils: 0 to 10 percent

## Major Component Description

*Surface layer texture:* Fine sandy loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Alluvium  
*Flooding:* None  
*Available water capacity:* Mainly 7.9 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

## Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## 104--McCullum fine sandy loam, gravelly substratum, 0 to 2 percent slopes

### Setting

*Landform:* Alluvial fans and stream terraces  
*Slope:* 0 to 2 percent  
*Elevation:* 2,500 to 3,300 feet  
*Mean annual precipitation:* 14 to 18 inches  
*Frost-free period:* 105 to 120 days

### Composition

#### Major Components

McCullum and similar soils: 85 percent

#### Minor Components

Jocko and similar soils: 0 to 10 percent  
Sacheen and similar soils: 0 to 5 percent

## Major Component Description

*Surface layer texture:* Fine sandy loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Alluvium  
*Flooding:* None  
*Available water capacity:* Mainly 6.4 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

## Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## McDonald Series

McDonald series consists of very deep, well drained soils on alluvial fans, stream terraces, and moraines. These soils formed in glacial till derived from glaciolacustrine deposits. Slope is 0 to 15 percent. Elevation is 3,000 to 3,800 feet. The average annual precipitation is 18 to 22 inches, average annual air temperature is 39 to 44 degrees F, and the frost-free period is 105 to 120 days.

**Taxonomic Class:** Fine, illitic Boralfic Argixerolls

### Typical Pedon

McDonald cobbly silty clay loam, 2 to 4 percent slopes, in an area of cropland; 1,320 feet south and 150 feet west of the northeast corner of sec. 6, T. 19 N., R. 19 W.

- Ap--0 to 7 inches; dark gray (10YR 4/1) cobbly silty clay loam, very dark gray (10YR 3/1) moist; strong fine and medium granular structure; slightly hard, friable, slightly sticky and plastic; many very fine, fine, and medium roots; many very fine tubular pores; 10 percent pebbles and 10 percent cobbles; slightly acid; clear smooth boundary.
- A--7 to 10 inches; dark grayish brown (10YR 4/2) cobbly silty clay loam, very dark grayish brown (10YR 3/2) moist; moderate fine and medium subangular blocky structure parting to moderate fine granular; hard, friable, slightly sticky and slightly plastic; many very fine and fine roots; common very fine and fine tubular and interstitial pores; 10 percent pebbles and

10 percent cobbles; slightly acid; clear wavy boundary.

E--10 to 14 inches; pinkish gray (7.5YR 6/2) cobbly loam, brown (7.5YR 5/2) moist; moderate medium subangular blocky structure parting to strong fine subangular blocky; hard, firm, sticky and plastic; many very fine and fine roots; many very fine and fine tubular pores; 10 percent pebbles and 10 percent cobbles; neutral; gradual wavy boundary.

Bt1--14 to 27 inches; light brown (7.5YR 6/4) cobbly clay, brown (7.5YR 5/4) moist; moderate coarse prismatic structure parting to strong medium subangular blocky; very hard, firm, sticky and very plastic; many very fine and fine roots; many very fine and fine tubular pores; few thin silt films on ped faces and are pinkish white (7.5YR 8/2), brown (7.5YR 5/2) moist; common faint clay films on faces of peds; 10 percent pebbles and 10 percent cobbles; neutral; gradual wavy boundary.

Bt2--27 to 42 inches; pinkish gray (7.5YR 6/2) silty clay, brown (7.5YR 5/4) moist; moderate very coarse prismatic structure; very hard, firm, sticky and plastic; common very fine roots and few coarse roots; many very fine tubular pores and few fine tubular pores; common distinct clay films on faces of peds and in pores; 5 percent pebbles and 5 percent cobbles; neutral; clear wavy boundary.

Bk1--42 to 53 inches; pinkish gray (7.5YR 7/2) silty clay loam, brown (7.5YR 5/4) moist; massive parting to moderate medium plates; very hard, firm, sticky and plastic; few fine roots; common very fine tubular pores; 5 percent pebbles and 5 percent cobbles; common thick seams and soft masses of lime; strongly effervescent; moderately alkaline; abrupt wavy boundary.

Bk2--53 to 60 inches; pinkish gray (7.5YR 7/2) silty clay loam, light brown (7.5YR 6/4) moist; massive parting to weak thick plates; very hard, firm, sticky and plastic; few very fine roots; few very fine pores; 5 percent pebbles and 5 percent cobbles; few fine threads of lime; slightly effervescent; moderately alkaline.

### Range in Characteristics

*Soil temperature:* 41 to 46 degrees F  
*Moisture control section:* Between 4 and 12 inches  
*Mollic epipedon thickness:* 10 to 16 inches  
*Content of clay in the control section:* 35 to 60 percent

*Depth to Bk horizon:* 30 to 45 inches

#### *Ap, A horizon*

Value: 4 or 5 dry; 2 or 3 moist  
 Chroma: 1 or 2; 1 chroma in the upper 7 inches  
 Texture: Silt loam or silty clay loam  
 Clay content: 27 to 35 percent  
 Content of rock fragments: 5 to 35 percent--0 to 15 percent cobbles and stones, 5 to 20 percent pebbles  
 Reaction: pH 6.1 to 7.3

#### *E horizon*

Hue: 7.5YR, 10YR, or 2.5Y  
 Value: 6, 7, or 8 dry; 5 or 6 moist  
 Chroma: 2 or 3  
 Texture: Loam or silt loam  
 Clay content: 15 to 27  
 Content of rock fragments: 10 to 35 percent--0 to 15 percent stones, 5 to 20 percent pebbles  
 Reaction: pH 6.6 to 7.3

#### *Bt horizons*

Hue: 10YR, 7.5YR, or 2.5Y  
 Value: 6 or 7 dry; 4, 5, or 6 moist  
 Chroma: 1, 2, 3, or 4  
 Texture: Clay or silty clay  
 Clay content: 40 to 60 percent  
 Content of rock fragments: 0 to 35 percent--0 to 15 percent cobbles and stones, 0 to 20 percent pebbles  
 Reaction: pH 6.6 to 7.3

#### *Bk1 horizon*

Hue: 7.5YR, 10YR, and 2.5Y  
 Value: 6, 7, or 8 dry; 5, 6, or 7 moist  
 Chroma: 2, 3, or 4  
 Texture: Silty clay loam or clay loam  
 Clay content: 27 to 35 percent  
 Content of rock fragments: 5 to 35 percent--0 to 15 percent cobbles and stones, 5 to 20 percent pebbles  
 Calcium carbonate equivalent: 5 to 11 percent  
 Reaction: pH 7.4 to 8.4

#### *Bk2 horizon*

Hue: 7.5YR, 10YR, or 2.5Y  
 Value: 5, 6, 7, or 8 dry; 4, 5, 6, or 7 moist  
 Chroma: 2, 3, or 4  
 Texture: Silty clay loam or clay loam  
 Clay content: 27 to 35 percent  
 Content of rock fragments: 5 to 35 percent--0 to 15 percent cobbles and stones, 5 to 20 percent pebbles  
 Calcium carbonate equivalent: 5 to 11 percent  
 Reaction: pH 7.4 to 8.4

## 105--McDonald cobbly silty clay loam, 2 to 4 percent slopes

### Setting

*Landform:* Moraines  
*Slope:* 2 to 4 percent  
*Elevation:* 3,000 to 3,800 feet  
*Mean annual precipitation:* 18 to 22 inches  
*Frost-free period:* 105 to 120 days

### Composition

#### Major Components

McDonald and similar soils: 85 percent

#### Minor Components

Connah and similar soils: 0 to 4 percent  
Walstead and similar soils: 0 to 3 percent  
McDonald, stony or bouldery: 0 to 3 percent  
Potholes in Kicking Horse area: 0 to 3 percent  
Somewhat poorly drained soils: 0 to 2 percent

### Major Component Description

*Surface layer texture:* Cobbly silty clay loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Till  
*Native plant cover type:* Forest land  
*Flooding:* None  
*Available water capacity:* Mainly 8.6 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Forest Land" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## 106--McDonald cobbly silty clay loam, 4 to 8 percent slopes

### Setting

*Landform:* Moraines  
*Slope:* 4 to 8 percent  
*Elevation:* 3,000 to 3,800 feet  
*Mean annual precipitation:* 18 to 22 inches  
*Frost-free period:* 105 to 120 days

### Composition

#### Major Components

McDonald and similar soils: 85 percent

#### Minor Components

Connah and similar soils: 0 to 4 percent  
Walstead and similar soils: 0 to 3 percent  
McDonald, stony or bouldery: 0 to 3 percent  
Potholes in Kicking Horse area: 0 to 3 percent  
Somewhat poorly drained soils: 0 to 2 percent

### Major Component Description

*Surface layer texture:* Cobbly silty clay loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Till  
*Native plant cover type:* Forest land  
*Flooding:* None  
*Available water capacity:* Mainly 8.7 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Forest Land" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## 107--McDonald cobbly silty clay loam, 8 to 15 percent slopes

### Setting

*Landform:* Moraines  
*Slope:* 8 to 15 percent  
*Elevation:* 3,000 to 3,800 feet  
*Mean annual precipitation:* 18 to 22 inches  
*Frost-free period:* 105 to 120 days

### Composition

#### Major Components

McDonald and similar soils: 85 percent

#### Minor Components

Connah and similar soils: 0 to 5 percent  
Walstead and similar soils: 0 to 4 percent  
McDonald, stony or bouldery: 0 to 3 percent  
Slopes more than 15 percent: 0 to 3 percent

### Major Component Description

*Surface layer texture:* Cobbly silty clay loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Till  
*Native plant cover type:* Forest land  
*Flooding:* None  
*Available water capacity:* Mainly 8.6 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Forest Land" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## 108--McDonald silty clay loam, 0 to 2 percent slopes

### Setting

*Landform:* Alluvial fans and stream terraces  
*Slope:* 0 to 2 percent  
*Elevation:* 3,000 to 3,800 feet  
*Mean annual precipitation:* 18 to 22 inches  
*Frost-free period:* 105 to 120 days

### Composition

#### Major Components

McDonald and similar soils: 85 percent

#### Minor Components

Connah and similar soils: 0 to 4 percent  
Kerl and similar soils: 0 to 3 percent  
Ninepipe and similar soils: 0 to 3 percent  
McDonald, stony: 0 to 3 percent  
Somewhat poorly drained soils: 0 to 2 percent

### Major Component Description

*Surface layer texture:* Silty clay loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Till  
*Native plant cover type:* Forest land  
*Flooding:* None  
*Available water capacity:* Mainly 9.0 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Forest Land" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## Minesinger Series

Minesinger series consists of very deep, well drained soils on relict stream terraces, alluvial fans, stream terraces, and hills. These soils formed in alluvium and colluvium. Slope is 4 to 45 percent. Elevation is 2,900 to 3,600 feet. The average annual precipitation is 14 to 20 inches, average annual air temperature is 41 to 45 degrees F, and the frost-free period is 105 to 120 days.

**Taxonomic Class:** Clayey-skeletal, mixed, frigid Typic Argixerolls

### Typical Pedon

Minesinger very stony loam in an area of Minesinger-Walstead very stony loams, 15 to 45 percent slopes, in rangeland; 1,750 feet west and 1,350 feet south of the northeast corner of sec. 11, T. 22 N., R. 23 W.

A1--0 to 6 inches; grayish brown (10YR 5/2) very stony loam, very dark grayish brown (10YR 3/2) moist; moderate coarse and medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many fine roots and common medium roots; few fine tubular pores; 10 percent stones, 10 percent cobbles, and 15 percent pebbles; neutral; clear smooth boundary.

A2--6 to 14 inches; grayish brown (10YR 5/2) very cobbly loam, very dark grayish brown (10YR 3/2) moist; moderate coarse and medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common fine roots and few coarse and medium roots; few fine tubular pores; 20 percent cobbles and 25 percent pebbles; neutral; abrupt smooth boundary.

E/B--14 to 24 inches; 75 percent is white (10YR 8/1) very cobbly loam, light brownish gray (10YR 6/2) moist (E part); 25 percent is pale brown (10YR 6/3) very cobbly clay loam, brown (10YR 5/3) moist (B part); moderate fine and medium subangular blocky structure; hard, firm, sticky and plastic; few fine and medium roots; common fine tubular pores and many fine interstitial pores; 15 percent cobbles and 25 percent pebbles; neutral; abrupt smooth boundary.

Bt1--24 to 32 inches; pale brown (10YR 6/3) very gravelly clay, brown (10YR 5/3) moist; strong coarse and medium angular blocky structure; very hard, firm, sticky and plastic; few fine and very fine roots; many fine and medium tubular

pores; 10 percent cobbles and 30 percent pebbles; neutral; clear wavy boundary.

Bt2--32 to 39 inches; very pale brown (10YR 7/3) very gravelly clay loam, pale brown (10YR 6/3) moist; strong coarse and medium angular blocky structure; very hard, firm, sticky and plastic; few fine and very fine roots; many medium and fine tubular pores; 10 percent cobbles and 30 percent pebbles; mildly alkaline; clear wavy boundary.

Bk1--39 to 45 inches; light gray (2.5Y 7/2) very cobbly clay loam, light brownish gray (2.5Y 6/2) moist; weak coarse subangular blocky structure; very hard, firm, sticky and plastic; few medium and very fine roots; many fine tubular pores; 15 percent cobbles and 30 percent pebbles; few medium masses and threads of lime; slightly effervescent; moderately alkaline; gradual wavy boundary.

Bk2--45 to 60 inches; light gray (2.5Y 7/2) very cobbly clay loam, light brownish gray (2.5Y 6/2) moist; massive; very hard, firm, sticky and plastic; few very fine roots; many fine tubular pores; 15 percent cobbles and 30 percent pebbles; few medium masses of lime; slightly effervescent; moderately alkaline.

### Range in Characteristics

*Soil temperature:* 43 to 47 degrees F

*Mollic epipedon thickness:* 8 to 14 inches

*Content of clay in the control section:* 35 to 50 percent

*Content of rock fragments in the control section:* 35 to 55 percent in the Bt horizon

*Depth to Bk horizon:* 36 to 50 inches

#### A1 horizon

Value: 4 or 5 dry; 2 or 3 moist

Chroma: 1 or 2

Clay content: 18 to 27 percent

Content of rock fragments: 25 to 50 percent--0 to 15 percent stones on or in surface layer, 5 to 15 percent cobbles, 10 to 20 percent pebbles

Reaction: pH 6.6 to 7.3

#### A2 horizon

Chroma: 2 or 3

Clay content: 18 to 27 percent

Content of rock fragments: 25 to 50 percent--0 to 15 percent stones, 5 to 20 percent cobbles, 15 to 25 percent pebbles

Reaction: pH 6.6 to 7.3

#### E/B horizon

Value: E part--7 or 8 dry and 5 or 6 moist; B part--6 or 7 dry and 5 or 6 moist

Texture: Loam or clay loam  
Clay content: 18 to 35 percent  
Content of rock fragments: 35 to 50 percent--0  
to 5 percent stones, 10 to 15 percent  
cobbles, 25 to 30 percent pebbles  
Reaction: pH 6.6 to 7.3

*Bt1 horizon*

Hue: 10YR or 7.5YR  
Value: 5, 6, or 7 dry; 4, 5, or 6 moist  
Chroma: 3 or 4  
Texture: Clay or clay loam  
Clay content: 35 to 50 percent  
Content of rock fragments: 35 to 55 percent--0  
to 10 percent stones, 10 to 15 percent  
cobbles, 25 to 30 percent pebbles  
Reaction: pH 6.6 to 7.3

*Bt2 horizon*

Hue: 10YR or 7.5YR  
Value: 5, 6, or 7 dry; 4, 5, or 6 moist  
Chroma: 3, 4, or 5  
Texture: Clay or clay loam  
Clay content: 35 to 50 percent  
Content of rock fragments: 35 to 55 percent--0  
to 10 percent stones, 10 to 15 percent  
cobbles, 25 to 30 percent pebbles  
Reaction: pH 6.6 to 7.8

*Bk1 horizon*

Hue: 10YR or 2.5Y  
Value: 6 or 7 dry; 4, 5, or 6 moist  
Chroma: 2 or 3  
Texture: Clay loam or clay  
Clay content: 27 to 40 percent  
Content of rock fragments: 35 to 55 percent--0  
to 10 percent stones 10 to 15 percent  
cobbles 25 to 30 percent pebbles  
Calcium carbonate equivalent: 3 to 8 percent  
Reaction: pH 7.4 to 8.4

*Bk2 horizon*

Hue: 10YR or 2.5Y  
Value: 6 or 7 dry; 4, 5, or 6 moist  
Chroma: 2 or 3  
Texture: Clay loam or clay  
Clay content: 27 to 40 percent  
Content of rock fragments: 35 to 55 percent--0  
to 10 percent stones, 10 to 15 percent  
cobbles, 25 to 30 percent pebbles  
Calcium carbonate equivalent: 3 to 8 percent  
Reaction: pH 7.4 to 8.4

**109--Minesinger stony loam, 4 to 15  
percent slopes**

**Setting**

*Landform:* Alluvial fans and stream terraces

*Slope:* 4 to 15 percent  
*Elevation:* 2,900 to 3,500 feet  
*Mean annual precipitation:* 14 to 18 inches  
*Frost-free period:* 105 to 120 days

**Composition**

**Major Components**

Minesinger and similar soils: 85 percent

**Minor Components**

Bowlake and similar soils: 0 to 5 percent

Nirada and similar soils: 0 to 5 percent

Minesinger extremely stony loam: 0 to 5 percent

**Major Component Description**

*Surface layer texture:* Stony loam

*Depth class:* Very deep (more than 60 inches)

*Drainage class:* Well drained

*Dominant parent material:* Alluvium or colluvium

*Native plant cover type:* Rangeland

*Flooding:* None

*Available water capacity:* Mainly 5.3 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

**Management**

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

**110--Minesinger-Walstead very stony  
loams, 15 to 45 percent slopes**

**Setting**

*Landform:*

\* Minesinger--Hills

\* Walstead--Hills

*Slope:*

\* Minesinger--15 to 45 percent, southwest aspect

\* Walstead--15 to 45 percent, north aspect

*Elevation:* 2,900 to 3,600 feet

*Mean annual precipitation:* 16 to 20 inches

*Frost-free period:* 100 to 110 days

### Composition

#### Major Components

Minesinger and similar soils: 65 percent

Walstead and similar soils: 25 percent

#### Minor Components

Niarada and similar soils: 0 to 3 percent

Bigarm and similar soils: 0 to 3 percent

Kerl and similar soils: 0 to 2 percent

Bowlake and similar soils: 0 to 2 percent

### Major Component Description

#### Minesinger

*Surface layer texture:* Very stony loam

*Depth class:* Very deep (more than 60 inches)

*Drainage class:* Well drained

*Dominant parent material:* Alluvium or colluvium

*Native plant cover type:* Rangeland

*Flooding:* None

*Available water capacity:* Mainly 5.1 inches

#### Walstead

*Surface layer texture:* Very stony loam

*Depth class:* Very deep (more than 60 inches)

*Drainage class:* Well drained

*Dominant parent material:* Alluvium

*Native plant cover type:* Rangeland

*Flooding:* None

*Available water capacity:* Mainly 5.5 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## M-W--Miscellaneous Water

### Composition

#### Major Components

Miscellaneous water: 100 percent

### Major Component Description

*Definition:* Areas of sewage lagoons, industrial waste pits, and fish hatcheries, etc.

## Mitten Series

Mitten series consists of very deep, somewhat excessively drained soils on mountain slopes. These soils formed in argillite or quartzite colluvium. The soils have a surface layer of volcanic ash-influenced loess. Slope is 8 to 60 percent. Elevation is 3,200 to 5,500 feet. The average annual precipitation is 25 to 45 inches, average annual air temperature is 39 to 43 degrees F, and the frost-free period is 60 to 90 days.

**Taxonomic Class:** Loamy-skeletal, mixed, frigid Andic Eutrochrepts

### Typical Pedon

Mitten very gravelly silt loam, 30 to 60 percent slopes, in an area of woodland; approximately 2,000 feet south and 1,800 feet east of the northwest corner of sec. 8, T. 17 N., R. 18 W.

Oi--3 to 2 inches; matted twigs and needles.  
Oe--2 inches to 0; decomposed organic matter.  
Bs--0 to 12 inches; light yellowish brown (10YR 6/4) very gravelly silt loam, dark yellowish brown (10YR 4/4) moist; weak medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; many fine and medium roots and common coarse roots; 30 percent subrounded pebbles and 5 percent subrounded cobbles; slightly acid; abrupt smooth boundary.  
2E1--12 to 23 inches; pale brown (10YR 6/3) extremely gravelly loam, grayish brown (10YR 5/2) moist; weak medium subangular blocky structure; soft, friable, nonsticky and nonplastic; many fine and medium roots and

common coarse roots; 70 percent subrounded pebbles and 10 percent subrounded cobbles; slightly acid; clear smooth boundary.  
2E2--23 to 36 inches; light gray (10YR 7/2) extremely gravelly sandy loam, grayish brown (10YR 5/2) moist; massive; loose, nonsticky and nonplastic; common fine and medium roots and few coarse roots; 70 percent subrounded pebbles and 10 percent subrounded cobbles; medium acid; clear wavy boundary.  
2E and Bw--36 to 60 inches; 80 percent is pinkish gray (7.5YR 7/2) extremely gravelly loam, brown (7.5YR 5/2) moist (E part); 20 percent is light olive brown (2.5Y 5/4) extremely gravelly fine sandy loam lamellae 1/8 to 1/4 inch thick, olive brown (2.5Y 4/4) moist (B part); massive; slightly hard, friable, slightly sticky and nonplastic; many very fine and fine discontinuous tubular pores; 60 percent subrounded pebbles and 10 percent subrounded cobbles; medium acid.

### Range in Characteristics

*Soil temperature:* 41 to 46 degrees F  
*Moisture control section:* Between 8 and 24 inches  
*Content of clay in the control section:* 5 to 10 percent

#### *Bs horizon*

Value: 4 or 5 moist  
Chroma: 3 or 4  
Clay content: 5 to 10 percent  
Content of rock fragments: 15 to 50 percent--0 to 30 percent angular cobbles, 10 to 45 percent angular pebbles  
Moist bulk density: 1.0 g/cc or less  
Reaction: pH 5.6 to 6.5

#### *2E horizons*

Hue: 10YR or 7.5YR  
Value: 6 or 7 dry; 4 or 5 moist  
Chroma: 2 or 3  
Texture: Very fine sandy loam, fine sandy loam, sandy loam, and loam  
Clay content: 5 to 10 percent  
Content of rock fragments: 35 to 80 percent--5 to 10 percent angular cobbles, 30 to 70 percent angular pebbles  
Reaction: pH 5.6 to 6.5

#### *2E and Bw horizon*

Hue: E part--7.5YR or 10YR; B part--2.5Y, 7.5YR, or 10YR  
Value: E part--6 or 7 dry and 5 or 6 moist; B part--5 or 6 dry and 4 or 5 moist  
Chroma: E part--2 or 3; B part--3 or 4

Texture: Very fine sandy loam, fine sandy loam, sandy loam, or loam  
Clay content, mixed: 5 to 10 percent  
Content of rock fragments: 60 to 80 percent--10 to 20 percent angular cobbles, 50 to 60 percent angular pebbles  
Reaction: pH 5.6 to 6.5  
Other features: Some pedons have a 2Bw and E horizon below the 2E and Bw horizon

## 111--Mitten gravelly silt loam, 8 to 30 percent slopes

### Setting

*Landform:* Mountains  
*Slope:* 8 to 30 percent  
*Elevation:* 4,000 to 5,500 feet  
*Mean annual precipitation:* 30 to 45 inches  
*Frost-free period:* 60 to 90 days

### Composition

#### Major Components

Mitten and similar soils: 85 percent

#### Minor Components

Courville and similar soils: 0 to 5 percent  
Tevis and similar soils: 0 to 5 percent  
Mitten, shallow to bedrock: 0 to 5 percent

### Major Component Description

*Surface layer texture:* Gravelly silt loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Somewhat excessively drained  
*Dominant parent material:* Colluvium  
*Native plant cover type:* Forest land  
*Flooding:* None  
*Available water capacity:* Mainly 3.3 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Forest Land" section

- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## 112--Mitten very gravelly silt loam, 30 to 60 percent slopes

### Setting

*Landform:* Mountains  
*Slope:* 30 to 60 percent  
*Elevation:* 3,500 to 5,500 feet  
*Mean annual precipitation:* 30 to 45 inches  
*Frost-free period:* 60 to 90 days

### Composition

#### Major Components

Mitten and similar soils: 85 percent

#### Minor Components

Courville and similar soils: 0 to 2 percent  
 Tevis and similar soils: 0 to 5 percent  
 Winkler and similar soils: 0 to 3 percent  
 Areas of rock outcrop: 0 to 3 percent  
 Mitten, shallow to rock: 0 to 2 percent

### Major Component Description

*Surface layer texture:* Very gravelly silt loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Somewhat excessively drained  
*Dominant parent material:* Colluvium  
*Native plant cover type:* Forest land  
*Flooding:* None  
*Available water capacity:* Mainly 2.9 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Forest Land" section
- \* "Agronomy" section

- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## 113--Mitten very gravelly silt loam, dry, 30 to 60 percent slopes

### Setting

*Landform:* Mountains  
*Slope:* 30 to 60 percent  
*Elevation:* 3,200 to 5,000 feet  
*Mean annual precipitation:* 25 to 30 inches  
*Frost-free period:* 70 to 90 days

### Composition

#### Major Components

Mitten and similar soils: 85 percent

#### Minor Components

Areas of rubble land: 0 to 5 percent  
 Areas of rock outcrop: 0 to 3 percent  
 Winkler and similar soils: 0 to 5 percent  
 Finleypoint, dry soils: 0 to 2 percent

### Major Component Description

*Surface layer texture:* Very gravelly silt loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Somewhat excessively drained  
*Dominant parent material:* Colluvium  
*Native plant cover type:* Forest land  
*Flooding:* None  
*Available water capacity:* Mainly 2.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Forest Land" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## 114--Mitten, dry-Rock outcrop complex, 30 to 60 percent slopes

### Setting

#### *Landform:*

- \* Mitten--Mountains
- \* Rock outcrop--Mountains

#### *Position on landform:*

- \* Mitten--Back slopes and foot slopes
- \* Rock outcrop--Shoulders and summits

#### *Slope:*

- \* Mitten--30 to 60 percent
- \* Rock outcrop--30 to 60 percent

*Elevation:* 3,200 to 5,000 feet

*Mean annual precipitation:* 25 to 30 inches

*Frost-free period:* 70 to 90 days

### Composition

#### Major Components

Mitten and similar soils: 60 percent

Rock outcrop: 25 percent

#### Minor Components

Mitten, shallow to rock: 0 to 2 percent

Areas of rubble land: 0 to 5 percent

Winkler and similar soils: 0 to 5 percent

Finleypoint, dry soils: 0 to 3 percent

### Major Component Description

#### Mitten

*Surface layer texture:* Very gravelly silt loam

*Depth class:* Very deep (more than 60 inches)

*Drainage class:* Somewhat excessively drained

*Dominant parent material:* Colluvium

*Native plant cover type:* Forest land

*Flooding:* None

*Available water capacity:* Mainly 2.8 inches

#### Rock outcrop

*Definition:* Exposures of bare bedrock

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Forest Land" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

### Moiese Series

Moiese series consists of very deep, excessively drained soils on stream terraces and outwash plains. These soils formed in alluvium. They are underlain by sand and gravel at a depth of 12 to 19 inches. Slope is 0 to 2 percent. Elevation is 2,700 to 3,000 feet. The average annual precipitation is 12 to 14 inches, average annual air temperature is 43 to 45 degrees F, and the frost-free period is 105 to 120 days.

**Taxonomic Class:** Sandy-skeletal, mixed, frigid Calcic Haploxerolls

### Typical Pedon

Moiese loam, 0 to 2 percent slopes, in an area of pasture; 2,500 feet west and 50 feet north of the southeast corner of sec. 18, T. 19 N., R. 21 W.

- Ap--0 to 8 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; many fine and very fine roots; 5 percent pebbles; neutral; abrupt smooth boundary.
- AB--8 to 13 inches; brown (10YR 5/3) sandy loam, dark brown (10YR 3/3) moist; moderate medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; many very fine and fine roots; 5 percent pebbles; neutral; clear smooth boundary.
- Bw--13 to 18 inches; pale brown (10YR 6/3) very gravelly sandy loam, brown (10YR 4/3) moist; moderate medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; many fine roots; 35 percent pebbles and 5 percent cobbles, 25 percent of the pebbles have moderately thick lime crusts of undersides; mildly alkaline; clear wavy boundary.
- 2Bk1--18 to 33 inches; light brownish gray (10YR 6/2) very gravelly loamy coarse sand; brown (10YR 5/3) moist; weak fine granular structure;

soft, very friable, nonsticky and nonplastic; common fine and very fine roots; 50 percent pebbles and 10 percent cobbles; common faint lime coatings on surface of pebbles and prominent lime crusts on underside of pebbles; 10 percent calcium carbonate; violently effervescent; moderately alkaline; gradual wavy boundary.

2Bk2--33 to 60 inches; very pale brown (10YR 7/2) extremely gravelly coarse sand, grayish brown (10YR 5/2) moist; single grain; loose, nonsticky and nonplastic; few fine roots; 60 percent pebbles and 10 percent cobbles; common faint lime coatings on tops and sides of pebbles and distinct lime crusts on undersides of pebbles; 5 percent calcium carbonate; strongly effervescent; moderately alkaline.

### Range in Characteristics

*Soil temperature:* 45 to 47 degrees F

*Moisture control section:* Between 12 and 35 inches

*Mollic epipedon thickness:* 7 to 16 inches

*Content of clay in the control section:* 5 to 15 percent

*Depth to Bk horizon:* 12 to 19 inches

*Depth to sand and gravel:* 12 to 19 inches

#### *Ap horizon*

Value: 4 or 5 dry; 2 or 3 moist

Chroma: 2 or 3

Clay content: 10 to 22 percent

Content of rock fragments: 0 to 35 percent--0 to 5 percent cobbles, 0 to 30 percent pebbles

Reaction: pH 6.1 to 7.3

#### *AB horizon*

Value: 4, 5, or 6 dry; 3 or 4 moist

Chroma: 2, 3, or 4

Texture: Loam or sandy loam

Clay content: 5 to 22 percent

Content of rock fragments: 5 to 60 percent--0 to 15 percent cobbles, 5 to 45 percent pebbles

Reaction: pH 6.6 to 7.3

#### *Bw horizon*

Value: 5 or 6 dry; 3, 4, or 5 moist

Chroma: 2, 3, or 4

Clay content: 5 to 15 percent

Content of rock fragments: 35 to 60 percent--0 to 15 percent cobbles, 35 to 45 percent pebbles

Reaction: pH 6.6 to 7.8

#### *2Bk1 horizon*

Hue: 10YR or 7.5YR

Value: 6 or 7 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Loamy sand, loamy coarse sand, sand, or fine sand

Clay content: 0 to 5 percent

Content of rock fragments: 50 to 75 percent--0 to 20 percent cobbles, 50 to 55 percent pebbles

Calcium carbonate equivalent: 8 to 15 percent

Reaction: pH 7.4 to 8.4

#### *2Bk2 horizon*

Hue: 10YR or 7.5YR

Value: 6 or 7 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Loamy coarse sand, coarse sand, or loamy sand

Clay content: 0 to 5 percent

Content of rock fragments: 50 to 85 percent--0 to 20 percent cobbles, 50 to 65 percent pebbles

Calcium carbonate equivalent: 5 to 10 percent

Reaction: pH 7.4 to 8.4

## 115--Moiese loam, 0 to 2 percent slopes

### Setting

*Landform:* Stream terraces and outwash plains

*Slope:* 0 to 2 percent

*Elevation:* 2,700 to 3,000 feet

*Mean annual precipitation:* 12 to 14 inches

*Frost-free period:* 105 to 120 days

### Composition

#### Major Components

Moiese and similar soils: 85 percent

#### Minor Components

Moiese gravelly loam: 0 to 6 percent

McCullum and similar soils: 0 to 6 percent

Slopes of 2 to 8 percent: 0 to 3 percent

### Major Component Description

*Surface layer texture:* Loam

*Depth class:* Very deep (more than 60 inches)

*Drainage class:* Excessively drained

*Dominant parent material:* Alluvium

*Native plant cover type:* Rangeland

*Flooding:* None

*Available water capacity:* Mainly 3.7 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

### Mollman Series

Mollman series consists of very deep, well drained soils on moraines and mountains. These soils formed in calcareous alpine till or colluvium. Slope is 0 to 60 percent. Elevation is 2,900 to 5,500 feet. The average annual precipitation is 25 to 35 inches, average annual air temperature is 38 to 43 degrees F, and the frost-free period is 70 to 90 days.

**Taxonomic Class:** Loamy-skeletal, mixed, frigid Typic Eutrochrepts

### Typical Pedon

Mollman gravelly loam, 15 to 30 percent slopes, in an area of woodland; approximately 1,000 feet south and 200 feet east of the northwest corner of sec. 19, T. 26 N., R. 18 W.

Oi--3 to 2 inches; undecomposed and slightly decomposed forest litter.

Oe--2 inches to 0; decomposed forest litter.

E--0 to 14 inches; very pale brown (10YR 7/3) gravelly loam, brown (10YR 5/3) moist; weak medium subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; many fine and medium roots; common fine tubular pores; 20 percent pebbles; slightly acid; clear wavy boundary.

E/Bw--14 to 31 inches; 80 percent is very pale brown (10YR 7/3) very gravelly loam, yellowish brown (10YR 5/4) moist (E part); 20 percent brownish yellow (10YR 6/6) very gravelly loam, yellowish brown (10YR 5/6) moist (B part);

moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common fine and medium roots; common fine and medium tubular pores; 10 percent cobbles and 40 percent pebbles; slightly acid; gradual wavy boundary.

Bw/E--31 to 38 inches; 55 percent brownish yellow (10YR 6/6) very gravelly loam, yellowish brown (10YR 5/6) moist (B part); 45 percent brownish yellow (10YR 6/3) very gravelly loam, yellowish brown (10YR 5/3) moist (E part); moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common fine and medium roots; common fine and medium tubular pores; 10 percent cobbles and 40 percent pebbles; mildly alkaline; clear wavy boundary.

Bk1--38 to 48 inches; very pale brown (10YR 8/3) very gravelly loam, pale brown (10YR 6/3) moist; massive; hard, friable, slightly sticky and slightly plastic; few fine and medium roots; few medium roots and common fine tubular pores; 15 percent cobbles and 40 percent pebbles; disseminated lime; violently effervescent with many medium seams of lime at top of horizon; moderately alkaline; clear wavy boundary.

Bk2--48 to 60 inches; white (10YR 8/2) very gravelly loam, light brownish gray (10YR 6/2) moist; massive; hard, friable, slightly sticky and slightly plastic; few fine roots; 15 percent cobbles and 40 percent pebbles; disseminated lime; violently effervescent; moderately alkaline.

### Range in Characteristics

*Soil temperature:* 40 to 45 degrees F

*Moisture control section:* Between 4 and 12 inches

*Control section:* 10 to 27 percent clay and 35 to 60 percent rock fragments

*Depth to Bk horizon:* 25 to 40 inches

#### *E horizon*

Hue: 10YR or 2.5Y

Value: 6 or 7 dry; 5 or 6 moist

Chroma: 2 or 3

Clay content: 10 to 27 percent

Content of rock fragments: 0 to 60 percent--0 to 20 percent cobbles and stones, 0 to 45 percent pebbles

Reaction: pH 6.1 to 7.3

#### *E/Bw horizon*

Hue: E part--10YR or 2.5Y; B part--7.5YR or 10YR  
Value: E part--6 or 7 dry and 5 or 6 moist; B part--5 or 6 dry and 4 or 5 moist  
Chroma: E part--2, 3 or 4; B part--6 or 8  
Texture: Loam or silt loam  
Clay content: 10 to 27 percent  
Content of rock fragments: 35 to 60 percent--10 to 20 percent cobbles and stones, 25 to 40 percent pebbles  
Reaction: pH 6.1 to 7.3

*Bw/E horizon*

Hue: B part--10YR or 2.5Y; E part--10YR or 2.5Y  
Value: B part--5 or 6 dry and 4, 5, or 6 moist; E part--6 or 7 dry and 5 or 6 moist  
Chroma: B part--6 or 8; E part--2, 3, or 4  
Texture: Loam or silt loam  
Clay content: 15 to 27 percent  
Content of rock fragments: 35 to 60 percent--10 to 20 percent cobbles and stones, 25 to 40 percent pebbles  
Reaction: pH 7.4 to 7.8

*Bk1 horizon*

Hue: 10YR or 2.5Y  
Value: 7 or 8 dry; 5 or 6 moist  
Chroma: 2, 3, or 4  
Texture: Loam or silt loam  
Clay content: 15 to 27 percent  
Content of rock fragments: 35 to 60 percent--10 to 20 percent cobbles and stones, 25 to 40 percent pebbles  
Calcium carbonate equivalent: 15 to 35 percent  
Reaction: pH 7.9 to 8.4

*Bk2 horizon*

Hue: 10YR or 2.5Y  
Value: 7 or 8 dry; 5 or 6 moist  
Chroma: 2, 3, or 4  
Texture: Loam or silt loam  
Clay content: 15 to 27 percent  
Content of rock fragments: 35 to 60 percent--10 to 20 percent cobbles and stones; 25 to 40 percent pebbles  
Calcium carbonate equivalent: 15 to 35 percent  
Reaction: pH 7.9 to 8.4

**116--Mollman gravelly loam, 0 to 4 percent slopes**

**Setting**

*Landform:* Moraines  
*Slope:* 0 to 4 percent

*Elevation:* 2,900 to 5,500 feet  
*Mean annual precipitation:* 25 to 35 inches  
*Frost-free period:* 70 to 90 days

**Composition**

**Major Components**

Mollman and similar soils: 85 percent

**Minor Components**

Somewhat poorly drained soils: 0 to 10 percent

Poorly drained soils: 0 to 5 percent

**Major Component Description**

*Surface layer texture:* Gravelly loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Alpine till  
*Native plant cover type:* Forest land  
*Flooding:* None  
*Available water capacity:* Mainly 7.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

**Management**

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Forest Land" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

**117--Mollman gravelly loam, 4 to 15 percent slopes**

**Setting**

*Landform:* Moraines  
*Slope:* 4 to 15 percent  
*Elevation:* 2,900 to 5,500 feet  
*Mean annual precipitation:* 25 to 35 inches  
*Frost-free period:* 70 to 90 days

## Composition

### Major Components

Mollman and similar soils: 85 percent

### Minor Components

Eaglewing and similar soils: 0 to 10 percent

Repp and similar soils: 0 to 5 percent

### Major Component Description

*Surface layer texture:* Gravelly loam

*Depth class:* Very deep (more than 60 inches)

*Drainage class:* Well drained

*Dominant parent material:* Alpine till

*Native plant cover type:* Forest land

*Flooding:* None

*Available water capacity:* Mainly 7.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Forest Land" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## 118--Mollman gravelly loam, 15 to 30 percent slopes

### Setting

*Landform:* Moraines

*Slope:* 15 to 30 percent

*Elevation:* 2,900 to 5,500 feet

*Mean annual precipitation:* 25 to 35 inches

*Frost-free period:* 70 to 90 days

### Composition

#### Major Components

Mollman and similar soils: 85 percent

#### Minor Components

Repp and similar soils: 0 to 5 percent

Trapps and similar soils: 0 to 5 percent

Yellowbay and similar soils: 0 to 5 percent

### Major Component Description

*Surface layer texture:* Gravelly loam

*Depth class:* Very deep (more than 60 inches)

*Drainage class:* Well drained

*Dominant parent material:* Alpine till

*Native plant cover type:* Forest land

*Flooding:* None

*Available water capacity:* Mainly 7.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Forest Land" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## 119--Mollman very gravelly loam, 30 to 60 percent slopes

### Setting

*Landform:* Mountains

*Slope:* 30 to 60 percent

*Elevation:* 3,000 to 5,500 feet

*Mean annual precipitation:* 25 to 35 inches

*Frost-free period:* 70 to 90 days

### Composition

#### Major Components

Mollman and similar soils: 85 percent

#### Minor Components

Repp and similar soils: 0 to 10 percent

Kingspoint and similar soils: 0 to 5 percent

### Major Component Description

*Surface layer texture:* Very gravelly loam

*Depth class:* Very deep (more than 60 inches)

*Drainage class:* Well drained  
*Dominant parent material:* Colluvium  
*Native plant cover type:* Forest land  
*Flooding:* None  
*Available water capacity:* Mainly 6.6 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Forest Land" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

### Niarada Series

Niarada series consists of very deep, well drained soils on stream terraces and moraines. These soils formed in alluvium and till. Slope is 0 to 60 percent. Elevation is 2,700 to 4,400 feet. The average annual precipitation is 14 to 18 inches, average annual air temperature is 41 to 45 degrees F, and the frost-free period is 105 to 120 days.

**Taxonomic Class:** Loamy-skeletal, mixed, frigid Calcic Haploxerolls

### Typical Pedon

Niarada gravelly loam, cool, 15 to 30 percent slopes, in an area of pasture; 1,650 feet west and 40 feet north of the southeast corner of sec. 6, T. 23 N., R. 21 W.

Ap--0 to 7 inches; very dark grayish brown (10YR 3/2) gravelly loam, very dark brown (10YR 2/2) moist; moderate medium granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots; few pores; 25 percent pebbles; neutral; clear smooth boundary.

A--7 to 14 inches; dark grayish brown (10YR 4/2) very gravelly loam, very dark grayish brown (10YR 3/2) moist; moderate medium blocky structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots, common medium roots; few very fine and fine tubular pores; 35 percent pebbles; neutral; clear wavy boundary.

Bw--14 to 18 inches; pale brown (10YR 6/3) very gravelly loam, grayish brown (10YR 5/2) moist; moderate medium subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots and common medium roots; few very fine and fine tubular pores; 50 percent pebbles and 5 percent cobbles; neutral; clear wavy boundary.

Bk1--18 to 29 inches; white (10YR 8/2) very gravelly loam, pale brown (10YR 6/3) moist; massive; soft, very friable, slightly sticky and slightly plastic; common very fine and fine roots and few medium roots; few fine and very fine tubular pores; 50 percent pebbles and 5 percent cobbles; disseminated lime and common distinct coatings of lime on undersides and sides of pebbles; violently effervescent; moderately alkaline; gradual wavy boundary.

Bk2--29 to 60 inches; light gray (10YR 7/2) very gravelly loam, brown (10YR 5/3) moist; massive; soft, very friable, slightly sticky and slightly plastic; few fine and medium roots; 50 percent pebbles and 5 percent cobbles; disseminated lime and common distinct coatings of lime covering pebbles; violently effervescent; moderately alkaline.

### Range in Characteristics

*Soil temperature:* 43 to 47 degrees F

*Moisture control section:* Between 4 and 12 inches

*Mollic epipedon thickness:* 7 to 20 inches

*Content of clay in the control section:* 10 to 18 percent

*Depth to Bk horizon:* 12 to 40 inches

#### Ap horizon

Value: 3, 4, or 5 dry; 2 or 3 moist

Chroma: 1 or 2

Clay content: 15 to 27 percent

Content of rock fragments: 15 to 35 percent--0 to 10 percent stones and cobbles, 15 to 25 percent pebbles

Reaction: pH 6.1 to 7.3

#### A horizon

Value: 4 or 5 dry; 2 or 3 moist

Chroma: 2 or 3

Clay content: 15 to 27 percent  
Content of rock fragments: 15 to 50 percent--0  
to 15 percent stones and cobbles, 15 to 40  
percent pebbles  
Reaction: pH 6.6 to 7.8

*Bw horizon*

Value: 5 or 6 dry; 3, 4, or 5 moist  
Chroma: 2, 3, or 4  
Texture: Loam or silt loam  
Clay content: 15 to 27 percent  
Content of rock fragments: 35 to 70 percent--5  
to 20 percent stones and cobbles, 25 to 55  
percent pebbles  
Reaction: pH 6.6 to 7.8

*Bk1 horizon*

Value: 6, 7, or 8 dry; 4, 5, or 6 moist  
Chroma: 2 or 3  
Texture: Loam or sandy loam  
Clay content: 10 to 18 percent  
Content of rock fragments: 35 to 65 percent--5  
to 25 percent stones and cobbles, 25 to 50  
percent pebbles  
Calcium carbonate equivalent: 15 to 35  
percent  
Reaction: pH 7.9 to 8.4

*Bk2 horizon*

Value: 6, 7, or 8 dry; 4 or 5 moist  
Chroma: 2 or 3  
Texture: Loam or sandy loam  
Clay content: 10 to 18 percent  
Content of rock fragments: 35 to 60 percent--5  
to 25 percent stones and cobbles, 35 to 50  
percent pebbles  
Calcium carbonate equivalent: 5 to 25 percent  
Reaction: pH 7.9 to 8.4

**120--Niarada gravelly loam, 0 to 4 percent slopes**

**Setting**

*Landform:* Stream terraces  
*Slope:* 0 to 5 percent  
*Elevation:* 2,900 to 3,600 feet  
*Mean annual precipitation:* 14 to 18 inches  
*Frost-free period:* 105 to 120 days

**Composition**

**Major Components**

Niarada and similar soils: 85 percent

**Minor Components**

Kerl and similar soils: 0 to 5 percent  
Jocko and similar soils: 0 to 5 percent  
Niarada stony loam: 0 to 5 percent

**Major Component Description**

*Surface layer texture:* Gravelly loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Alluvium  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 5.2 inches  
A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

**Management**

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

**121--Niarada gravelly loam, 4 to 8 percent slopes**

**Setting**

*Landform:* Moraines  
*Slope:* 4 to 8 percent  
*Elevation:* 2,700 to 4,400 feet  
*Mean annual precipitation:* 14 to 18 inches  
*Frost-free period:* 105 to 120 days

**Composition**

**Major Components**

Niarada and similar soils: 85 percent

**Minor Components**

Kerl and similar soils: 0 to 5 percent  
Jocko and similar soils: 0 to 5 percent  
Niarada stony loam: 0 to 5 percent

**Major Component Description**

*Surface layer texture:* Gravelly loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained

*Dominant parent material:* Alluvium  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 5.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

### 122--Niarada gravelly loam, 8 to 15 percent slopes

#### Setting

*Landform:* Moraines  
*Slope:* 8 to 15 percent  
*Elevation:* 3,000 to 4,400 feet  
*Mean annual precipitation:* 14 to 18 inches  
*Frost-free period:* 105 to 120 days

#### Composition

##### Major Components

Niarada and similar soils: 85 percent

##### Minor Components

Jocko and similar soils: 0 to 5 percent  
McCollum and similar soils: 0 to 5 percent  
Niarada very stony loam: 0 to 5 percent

#### Major Component Description

*Surface layer texture:* Gravelly loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Till  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 5.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

### 123--Niarada gravelly loam, cool, 15 to 30 percent slopes

#### Setting

*Landform:* Moraines  
*Slope:* 15 to 30 percent  
*Elevation:* 2,900 to 3,600 feet  
*Mean annual precipitation:* 14 to 18 inches  
*Frost-free period:* 105 to 120 days

#### Composition

##### Major Components

Niarada and similar soils: 85 percent

##### Minor Components

Areas of rock outcrop: 0 to 2 percent  
Jocko and similar soils: 0 to 5 percent  
Niarada stony loam: 0 to 3 percent  
Hogsby and similar soils: 0 to 5 percent

#### Major Component Description

*Surface layer texture:* Gravelly loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Till  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 5.3 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is

available in the "Soil Properties" section, Part II, of this publication.

### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

### 124--Niarada gravelly loam, cool, 30 to 60 percent slopes

#### Setting

*Landform:* Moraines

*Slope:* 30 to 60 percent

*Elevation:* 2,900 to 3,600 feet

*Mean annual precipitation:* 14 to 18 inches

*Frost-free period:* 105 to 120 days

#### Composition

##### Major Components

Niarada and similar soils: 85 percent

##### Minor Components

Hogsby and similar soils: 0 to 5 percent

Walstead and similar soils: 0 to 3 percent

Flott and similar soils: 0 to 5 percent

Areas of rock outcrop: 0 to 2 percent

#### Major Component Description

*Surface layer texture:* Gravelly loam

*Depth class:* Very deep (more than 60 inches)

*Drainage class:* Well drained

*Dominant parent material:* Till

*Native plant cover type:* Rangeland

*Flooding:* None

*Available water capacity:* Mainly 5.3 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

### 125--Niarada-Kerl complex, 8 to 15 percent slopes

#### Setting

*Landform:*

- \* Niarada--Moraines

- \* Kerl--Moraines

*Position on landform:*

- \* Niarada--Back slopes and shoulders

- \* Kerl--Foot slopes and toe slopes

*Slope:*

- \* Niarada--8 to 15 percent

- \* Kerl--8 to 15 percent

*Elevation:* 2,900 to 3,600 feet

*Mean annual precipitation:* 14 to 18 inches

*Frost-free period:* 105 to 120 days

#### Composition

##### Major Components

Niarada and similar soils: 45 percent

Kerl and similar soils: 45 percent

##### Minor Components

Ninepipe and similar soils: 0 to 4 percent

Polson and similar soils: 0 to 3 percent

Niarada stony loam: 0 to 3 percent

#### Major Component Description

##### Niarada

*Surface layer texture:* Gravelly loam

*Depth class:* Very deep (more than 60 inches)

*Drainage class:* Well drained

*Dominant parent material:* Till

*Native plant cover type:* Rangeland

*Flooding:* None

*Available water capacity:* Mainly 5.2 inches

##### Kerl

*Surface layer texture:* Silt loam

*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Till  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 10.7 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

## Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## Ninepipe Series

Ninepipe series consists of very deep, moderately well drained soils on low stream terraces, alluvial fans, and drainageways. These soils formed in alluvium. Slope is 0 to 2 percent. Elevation is 2,600 to 3,400 feet. The average annual precipitation is 14 to 19 inches, average annual air temperature is 40 to 45 degrees F, and the frost-free period is 105 to 130 days.

**Taxonomic Class:** Fine-silty, mixed, frigid Pachic Haploxerolls

## Typical Pedon

Ninepipe silt loam, 0 to 2 percent slopes, in an area of cropland; approximately 1,800 feet east and 100 feet north of the southwest corner of sec. 24, T. 19 N., R. 20 W.

Ap--0 to 10 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; moderate medium granular structure; soft, very friable, slightly sticky and slightly plastic; many roots; slightly effervescent; mildly alkaline; abrupt wavy boundary.

Bw1--10 to 21 inches; brown (10YR 5/3) silt loam, dark brown (10YR 3/3) moist; weak

coarse prismatic structure parting to weak medium subangular blocky; soft, very friable, slightly sticky and slightly plastic; common very fine and fine roots and few coarse roots; few fine tubular pores and many very fine tubular pores; strongly effervescent; moderately alkaline; clear wavy boundary.  
Bw2--21 to 28 inches; brown (10YR 5/3) silt loam, dark brown (10YR 3/3) moist; weak medium subangular blocky structure; soft, friable, slightly sticky and slightly plastic; common very fine and fine roots and few coarse roots; many very fine and fine tubular pores and common medium tubular pores; strongly effervescent; moderately alkaline; clear smooth boundary.

Bw3--28 to 41 inches; pale brown (10YR 6/3) silty clay loam, brown (10YR 5/3) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and plastic; many very fine and fine roots and few medium roots; many very fine and fine tubular pores and few medium tubular pores; strongly effervescent; mildly alkaline; clear smooth boundary.

C1--41 to 52 inches; very pale brown (10YR 7/3) silt loam, brown (10YR 5/3) moist; massive; soft, friable, slightly sticky and slightly plastic; strongly effervescent; mildly alkaline; clear smooth boundary.

C2--52 to 60 inches; very pale brown (10YR 7/3) silty clay loam, brown (10YR 5/3) moist; massive; slightly hard, firm, sticky and plastic; strongly effervescent; mildly alkaline.

## Range in Characteristics

*Soil temperature:* 42 to 47 degrees F

*Mollic epipedon thickness:* 20 to 33 inches

*Content of clay in the control section:* 18 to 35 percent

*Moisture control section:* Between 4 and 12 inches

*Depth to water table:* 48 to 72 inches

### Ap horizon

Value: 4 or 5 dry; 2 or 3 moist

Chroma: 2 or 3

Clay content: 18 to 27 percent

Reaction: pH 6.6 to 7.8

### Bw1, Bw2 horizons

Value: 4 or 5 dry; 2 or 3 moist

Chroma: 2 or 3

Clay content: 18 to 27 percent

Reaction: pH 7.4 to 8.4

### Bw3 horizon

Value: 6 or 7 dry; 5 or 6 moist

Chroma: 2 or 3  
Clay content: 27 to 35 percent  
Reaction: pH 7.4 to 8.4

*C1, C2 horizons*

Hue: 10YR or 7.5YR  
Value: 5, 6, or 7 dry; 4, 5, or 6 moist  
Chroma: 2 or 3  
Texture: Silt loam or silty clay loam  
Clay content: 18 to 35 percent  
Reaction: pH 7.4 to 8.4

**126--Ninepipe silt loam, 0 to 2 percent slopes**

**Setting**

*Landform:* Alluvial fans, stream terraces, and drainageways

*Slope:* 0 to 2 percent

*Elevation:* 2,600 to 3,400 feet

*Mean annual precipitation:* 14 to 19 inches

*Frost-free period:* 105 to 130 days

**Composition**

**Major Components**

Ninepipe and similar soils: 85 percent

**Minor Components**

Bohnlly and similar soils: 0 to 5 percent

Belton and similar soils: 0 to 10 percent

**Major Component Description**

*Surface layer texture:* Silt loam

*Depth class:* Very deep (more than 60 inches)

*Drainage class:* Moderately well drained

*Dominant parent material:* Alluvium

*Flooding:* None

*Water table:* Apparent

*Available water capacity:* Mainly 10.6 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

**Management**

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

\* "Agronomy" section

\* "Recreation" section

\* "Wildlife Habitat" section

\* "Engineering" and "Soil Properties" sections

**Phillcher Series**

Phillcher series consists of very deep, somewhat excessively drained soils on mountain slopes. These soils formed in colluvium derived from argillite and quartzite. The surface layer of these soils has a high component of volcanic ash. Slope is 15 to 75 percent. Elevation is 6,000 to 7,200 feet. The average annual precipitation is 60 to 70 inches, average annual air temperature is 33 to 36 degrees F, and the frost-free period is 30 to 40 days.

**Taxonomic Class:** Loamy-skeletal, mixed Andic Cryochrepts

**Typical Pedon**

Phillcher gravelly silt loam, in an area of Phillcher-Rock outcrop complex, 45 to 75 percent slopes, in woodland; approximately 300 feet south and 1,300 feet east of the northwest corner of sec. 6, T. 22 N., R. 18 W.

Oe--3 inches to 0; partially decomposed forest litter; abrupt wavy boundary.

Bs--0 to 11 inches; light yellowish brown (10YR 6/4) gravelly silt loam, dark yellowish brown (10YR 4/4) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine and fine roots and common medium and coarse roots; 30 percent pebbles; medium acid; abrupt smooth boundary.

2Bw1--11 to 22 inches; very pale brown (10YR 7/3) very gravelly sandy loam, yellowish brown (10YR 5/4) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine and fine roots and common medium and coarse roots; common fine and medium pores; 45 percent pebbles and 5 percent cobbles; medium acid; clear wavy boundary.

2Bw2--22 to 37 inches; very pale brown (10YR 7/3) very gravelly sandy loam, brown (10YR 5/3) moist; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; few very fine, fine, and medium roots; 50 percent pebbles and 5 percent cobbles; medium acid; abrupt wavy boundary.

2C--37 to 60 inches; very pale brown (10YR 7/3) extremely gravelly sandy loam, yellowish

brown (10YR 5/4) moist; massive; soft, very friable, nonsticky and nonplastic; few very fine, fine, and medium roots; 60 percent angular pebbles and 10 percent angular cobbles; medium acid.

### Range in Characteristics

*Soil temperature:* 35 to 38 degrees F  
*Moisture control section:* Between 8 to 24 inches  
*Content of clay in the control section:* 0 to 10 percent

#### *Bs horizon*

Hue: 10YR or 7.5YR  
Value: 4, 5, or 6 dry; 2, 3, or 4 moist  
Chroma: 2, 3, or 4  
Clay content: 5 to 10 percent  
Content of rock fragments: 15 to 35 percent pebbles  
Moist bulk density: 0.95 g/cc or less  
Reaction: pH 5.6 to 6.0

#### *2Bw horizons*

Hue: 10YR, 7.5YR, or 2.5Y  
Value: 6 or 7 dry; 4 or 5 moist  
Chroma: 2, 3, or 4  
Clay content: 0 to 10 percent  
Content of rock fragments: 35 to 60 percent--0 to 10 percent cobbles, 35 to 50 percent pebbles  
Reaction: pH 5.6 to 6.0

#### *2C horizon*

Hue: 10YR, 7.5YR, or 2.5Y  
Value: 6 or 7 dry; 4 or 5 moist  
Chroma: 2, 3, or 4  
Texture: Sandy loam or loamy sand  
Clay content: 0 to 10 percent  
Content of rock fragments: 60 to 80 percent--5 to 20 percent cobbles, 55 to 60 percent pebbles  
Reaction: pH 5.6 to 6.0

## 127--Phillcher gravelly silt loam, 15 to 45 percent slopes

### Setting

*Landform:* Mountains  
*Slope:* 15 to 45 percent  
*Elevation:* 6,000 to 7,200 feet  
*Mean annual precipitation:* 60 to 70 inches  
*Frost-free period:* 30 to 40 days

## Composition

### Major Components

Phillcher and similar soils: 85 percent

### Minor Components

Holloway and similar soils: 0 to 5 percent  
Areas of rock outcrop: 0 to 5 percent  
Holloway shallow to rock: 0 to 5 percent

### Major Component Description

*Surface layer texture:* Gravelly silt loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Somewhat excessively drained  
*Dominant parent material:* Colluvium  
*Native plant cover type:* Forest land  
*Flooding:* None  
*Available water capacity:* Mainly 4.4 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Forest Land" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## 128--Phillcher-Rock outcrop complex, 45 to 75 percent slopes

### Setting

*Landform:* Mountains  
*Slope:*  
\* Phillcher--45 to 75 percent  
\* Rock outcrop--45 to 75 percent  
*Elevation:* 6,000 to 7,200 feet  
*Mean annual precipitation:* 60 to 70 inches  
*Frost-free period:* 30 to 40 days

## Composition

### Major Components

Phillcher and similar soils: 70 percent  
Rock outcrop: 15 percent

### Minor Components

Phillcher shallow to rock: 0 to 5 percent  
Holloway, cool soils: 0 to 5 percent  
Areas of rubble land: 0 to 5 percent

## Major Component Description

### Phillcher

*Surface layer texture:* Gravelly silt loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Somewhat excessively drained  
*Dominant parent material:* Colluvium  
*Native plant cover type:* Forest land  
*Flooding:* None  
*Available water capacity:* Mainly 4.4 inches

### Rock outcrop

*Definition:* Exposures of bare bedrock

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

## Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Forest Land" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## 129--Pits, gravel

## Composition

### Major Components

Pits: 90 percent

### Minor Components

Areas supporting vegetation: 0 to 10 percent

## Major Component Description

*Definition:* Areas that have been excavated for gravel, sand, or rock material. These areas support little or no vegetation.

## Polson Series

Polson series consists of very deep, well drained soils on alluvial fans and stream terraces. These soils formed in lacustrine, glaciofluvial, or glaciolacustrine deposits. Slope is 0 to 8 percent. Elevation is 2,800 to 3,300 feet. The average annual precipitation is about 14 to 19 inches, average annual air temperature is 40 to 45 degrees F, and the frost-free period is 105 to 130 days.

**Taxonomic Class:** Fine-silty, mixed, frigid Typic Natrixerolls

## Typical Pedon

Polson silt loam, 0 to 2 percent slopes, in an area of cropland; approximately 660 feet south and 1,840 feet west of the northeast corner of sec. 10, T. 21 N., R. 20 W.

- Ap--0 to 7 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; slightly hard, very friable, nonsticky and nonplastic; many very fine roots; many fine pores; mildly alkaline; abrupt wavy boundary.
- E/Btn--7 to 10 inches; 60 percent is white (10YR 8/2) silt loam, light brownish gray (10YR 6/2) moist (E part); 40 percent is very pale brown (10YR 7/3) silt loam, brown (10YR 5/3) moist (Bt part); weak coarse subangular blocky structure; hard, very friable, slightly sticky and slightly plastic; common very fine roots; many very fine pores; few faint clay films on faces of peds; mildly alkaline; clear wavy boundary.
- Btn--10 to 15 inches; pale brown (10YR 6/3) silt loam, brown (10YR 4/3) moist; weak medium and coarse prismatic structure; hard, very friable, slightly sticky and slightly plastic; few very fine roots; many very fine discontinuous tubular pores; few faint clay films on faces of peds; moderately alkaline; clear wavy boundary.
- Bkn1--15 to 18 inches; very pale brown (10YR 7/3) silt loam, brown (10YR 4/3) moist; weak

medium and coarse prismatic structure; hard, very friable, slightly sticky and slightly plastic; common soft threads and seams of lime; violently effervescent; strongly alkaline; clear wavy boundary.

Bkn2--18 to 24 inches; white (10YR 8/2) silt loam, light brownish gray (10YR 6/2) moist; massive; 1/8- to 1-inch thick varved material that parts to weak very coarse blocks; slightly hard, very friable, slightly sticky and nonplastic; few very fine roots; common very fine pores; disseminated lime and few small masses of limes; violently effervescent; strongly alkaline; gradual irregular boundary.

BCn--24 to 60 inches; white (10YR 8/2) silt loam, light brownish gray (10YR 6/2) and brown (10YR 4/4) moist with 1/4- to 1/2-inch thick varves; massive; slightly hard, very friable, slightly sticky and nonplastic; few very fine pores; disseminated lime; violently effervescent; strongly alkaline.

### Range in Characteristics

*Soil temperature:* 41 to 47 degrees F

*Moisture control section:* Between 4 and 12 inches

*Mollic epipedon thickness:* 7 to 19 inches

*Content of clay in the control section:* 18 to 35 percent

*Depth to Bk horizon:* 15 to 26 inches

*Depth to varved lake sediments:* 15 to 36 inches

#### *Ap horizon*

Hue: 10YR or 2.5Y

Value: 4 or 5 dry; 2 or 3 moist

Chroma: 2 or 3

Clay content: 15 to 25 percent

Reaction: pH 7.4 to 7.8

#### *E/Btn horizon*

Hue: E part--10YR or 2.5Y; B part--10YR or 2.5Y

Value: E part--7 or 8 dry and 5 or 6 moist; B part--6 or 7 dry and 4 or 5 moist

Chroma: E part--2 or 3; B part--2 or 3

Clay content: 15 to 25 percent

Electrical conductivity: Less than 2 mmhos/cm

Reaction: pH 7.4 to 7.8

#### *Btn horizon*

Hue: 10YR or 2.5Y

Value: 6 or 7 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Silt loam or silty clay loam

Clay content: 18 to 35 percent

Electrical conductivity: 2 to 4 mmhos/cm

Sodium adsorption ratio: 13 to 18

Reaction: pH 7.4 to 9.0

#### *Bkn1 horizon*

Hue: 10YR or 2.5Y

Value: 6 or 7 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Silt loam or silty clay loam

Clay content: 18 to 35 percent

Electrical conductivity: 2 to 4 mmhos/cm

Calcium carbonate equivalent: 10 to 15 percent

Sodium adsorption ratio: 13 to 18

Reaction: pH 8.5 to 9.0

#### *Bkn2 horizon*

Hue: 10YR or 2.5Y

Value: 7 or 8 dry; 5 or 6 moist

Chroma: 2 or 3

Texture: Silt loam or silty clay loam

Clay content: 15 to 30 percent

Calcium carbonate equivalent: 10 to 15 percent

Electrical conductivity: 4 to 8 mmhos/cm

Sodium adsorption ratio: 15 to 20

Reaction: pH 8.5 to 9.0

#### *BCn horizon*

Hue: 10YR or 2.5Y

Value: 7 or 8 dry; 5 or 6 moist

Chroma: 2 or 3

Texture: Silt loam or silty clay loam

Clay content: 15 to 30 percent

Electrical conductivity: 4 to 8 mmhos/cm

Sodium adsorption ratio: 15 to 30

Reaction: pH 8.5 to 9.0

## 130--Polson silt loam, 0 to 2 percent slopes

### Setting

*Landform:* Alluvial fans and stream terraces

*Slope:* 0 to 2 percent

*Elevation:* 2,900 to 3,300 feet

*Mean annual precipitation:* 14 to 18 inches

*Frost-free period:* 105 to 130 days

### Composition

#### Major Components

Polson and similar soils: 85 percent

#### Minor Components

Belton and similar soils: 0 to 5 percent

Gird and similar soils: 0 to 5 percent

Truscreek and similar soils: 0 to 5 percent

## Major Component Description

*Surface layer texture:* Silt loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Glaciofluvial deposits  
*Flooding:* None  
*Sodium affected:* Sodic within 30 inches  
*Available water capacity:* Mainly 8.5 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

## Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## 131--Polson silt loam, 2 to 4 percent slopes

### Setting

*Landform:* Alluvial fans and stream terraces  
*Slope:* 2 to 4 percent  
*Elevation:* 2,900 to 3,300 feet  
*Mean annual precipitation:* 14 to 18 inches  
*Frost-free period:* 105 to 130 days

### Composition

#### Major Components

Polson and similar soils: 85 percent

#### Minor Components

Gird and similar soils: 0 to 5 percent  
Truscreek and similar soils: 0 to 5 percent  
Areas of slickspots: 0 to 5 percent

## Major Component Description

*Surface layer texture:* Silt loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Glaciofluvial deposits  
*Flooding:* None

*Sodium affected:* Sodic within 30 inches  
*Available water capacity:* Mainly 8.5 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

## Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## 132--Polson-Vincom silt loams, 4 to 8 percent slopes

### Setting

#### *Landform:*

- \* Polson--Alluvial fans and stream terraces
- \* Vincom--Alluvial fans and stream terraces

#### *Position on landform:*

- \* Polson--Back slopes and foot slopes
- \* Vincom--Shoulders and summits

#### *Slope:*

- \* Polson--4 to 8 percent
- \* Vincom--4 to 8 percent

*Elevation:* 2,900 to 3,300 feet

*Mean annual precipitation:* 14 to 17 inches

*Frost-free period:* 105 to 120 days

### Composition

#### Major Components

Polson and similar soils: 70 percent  
Vincom and similar soils: 15 percent

#### Minor Components

Truscreek and similar soils: 0 to 5 percent  
Ninepipe and similar soils: 0 to 5 percent  
Gird and similar soils: 0 to 5 percent

## Major Component Description

### Polson

*Surface layer texture:* Silt loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained

*Dominant parent material:* Glaciolacustrine deposits  
*Flooding:* None  
*Sodium affected:* Sodic within 30 inches  
*Available water capacity:* Mainly 8.5 inches

#### **Vincom**

*Surface layer texture:* Silt loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Glaciolacustrine deposits  
*Flooding:* None  
*Sodium affected:* Sodic within 30 inches  
*Available water capacity:* Mainly 9.0 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### **Management**

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

### **Post Series**

Post series consists of very deep, well drained soils on moraines and lake plains. These soils formed in strongly alkaline clayey glacial till or glaciolacustrine deposits. Slope is 0 to 15 percent. Elevation is 2,700 to 3,200 feet. The average annual precipitation is 14 to 18 inches, average annual air temperature is 42 to 45 degrees F, and the frost-free period is 105 to 135 days.

**Taxonomic Class:** Very-fine, illitic, frigid Typic Natrixerolls

### **Typical Pedon**

Post silt loam, 0 to 2 percent slopes, in an area of cropland; 450 feet east and 132 feet north of the southwest corner of sec. 30, T. 20 N., R. 20 W.

Ap--0 to 6 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak medium platy structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine and fine roots; many very fine tubular pores; neutral; abrupt smooth boundary.

Btn/E--6 to 9 inches; 55 percent is very pale brown (10YR 7/3) and pink (7.5YR 7/4) silty clay, brown (7.5YR 5/4) moist (B part); 45 percent is light gray (10YR 7/1) and light brownish gray (10YR 6/2) silt loam, brown (10YR 5/3) moist (E part); strong medium columnar structure parting to moderate fine and medium angular blocky; very hard, firm, sticky and plastic; many very fine roots between prism faces and few very fine roots within peds; many very fine tubular pores and few medium tubular pores; moderately alkaline; clear smooth boundary.

Btn--9 to 21 inches; pink (7.5YR 7/4) clay, brown (7.5YR 5/4) moist; strong medium prismatic structure parting to moderate fine and medium angular blocky; very hard, very firm, very sticky and very plastic; many very fine roots between prism faces and common very fine roots within peds; common very fine and fine tubular pores; continuous prominent brown (10YR 5/2) and brown (7.5YR 4/4) moist clay films on faces of peds and in pores; common distinct gray (10YR 5/1) silt films in pores and on ped faces; strongly alkaline; gradual smooth boundary.

Bkn--21 to 27 inches; very pale brown (10YR 7/3) clay, brown (10YR 5/3) moist; massive; 1/4- to 1/2-inch thick varves; hard, firm, very sticky and very plastic; common very fine roots; common very fine tubular pores; 5 percent pebbles; few fine masses of soft lime between varves; strongly effervescent; strongly alkaline; clear smooth boundary.

C--27 to 60 inches; very pale brown (10YR 7/3) clay, brown (10YR 5/3) moist; massive; 1/4- to 1/2-inch thick varves; hard, firm, very sticky and very plastic; 5 percent pebbles; few fine masses of soft lime between varves and embodying calcareous fragments; strongly effervescent; strongly alkaline.

### **Range in Characteristics**

*Soil temperature:* 44 to 47 degrees F

*Moisture control section:* Between 4 and 12 inches

*Mollic epipedon thickness:* 7 to 9 inches thick

*Control section:* 60 to 80 percent clay and less than 10 percent fine sand or coarser

*Depth to Bk horizon:* 17 to 26 inches

*Depth to varves:* 17 to 26 inches

*Ap horizon*

Value: 4 or 5 dry; 2 or 3 moist

Chroma: 2 or 3

Texture: Silt loam or silty clay loam

Clay content: 20 to 35 percent

Content of rock fragments: 0 to 15 percent--0 to 5 percent cobbles, 0 to 10 percent pebbles

Sodium adsorption ratio: 4 to 10

Reaction: pH 6.1 to 7.3

*Btn/E horizon*

Hue: 10YR or 7.5YR

Value: B part--6 or 7 moist

Chroma: B part--3 or 4; E part--2 or 1

Texture: B part--silty clay loam or silty clay; E part--silt loam or loam; mixed silty clay loam

Clay content: B part--35 to 45 percent; E part--18 to 27 percent; mixed--27 to 40 percent

Content of rock fragments: 0 to 15 percent--0 to 5 percent cobbles, 0 to 10 percent pebbles

Sodium adsorption ratio: 13 to 20

Reaction: pH 7.9 to 9.0

*Btn horizon*

Hue: 7.5YR or 10YR

Value: 7 or 6 dry

Chroma: 2, 3, or 4

Clay content: 60 to 80 percent; 2 to 8 percent fine sand or coarser

Content of rock fragments: 0 to 15 percent--0 to 5 percent cobbles, 0 to 10 percent pebbles

Electrical conductivity: 0 to 4 mmhos/cm

Sodium adsorption ratio: 15 to 40

Reaction: pH 8.5 to 9.0

*Bkn horizon*

Hue: 10YR or 7.5YR

Value: 6 or 7 dry; 5 or 6 moist

Clay content: 60 to 80 percent; 6 to 15 percent fine sand or coarser

Content of rock fragments: 0 to 15 percent--0 to 5 percent cobbles, 0 to 10 percent pebbles

Calcium carbonate equivalent: 5 to 15 percent

Electrical conductivity: 2 to 8 mmhos/cm

Sodium adsorption ratio: 25 to 45

Reaction: pH 7.9 to 9.0

*C horizon*

Hue: 10YR or 7.5YR

Value: 6 or 7 dry; 5 or 6 moist

Chroma: 2, 3, or 4

Clay content: 60 to 70 percent; 6 to 15 percent fine sand or coarser

Content of rock fragments: 0 to 15 percent--0 to 5 percent cobbles, 0 to 10 percent pebbles

Electrical conductivity: 4 to 8 mmhos/cm

Sodium adsorption ratio: 20 to 45

Reaction: pH 8.5 to 9.0

## 133--Post silt loam, 0 to 2 percent slopes

### Setting

*Landform:* Moraines

*Slope:* 0 to 2 percent

*Elevation:* 2,700 to 3,100 feet

*Mean annual precipitation:* 14 to 18 inches

*Frost-free period:* 105 to 135 days

### Composition

#### Major Components

Post and similar soils: 85 percent

#### Minor Components

Ronan and similar soils: 0 to 6 percent

Post cobbly silt loam: 0 to 6 percent

Somewhat poorly drained soils: 0 to 2 percent

Water: 0 to 1 percent

### Major Component Description

*Surface layer texture:* Silt loam

*Depth class:* Very deep (more than 60 inches)

*Drainage class:* Well drained

*Dominant parent material:* Till

*Flooding:* None

*Sodium affected:* Sodic within 30 inches

*Available water capacity:* Mainly 7.6 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section

\* "Engineering" and "Soil Properties" sections

### 134--Post silty clay loam, 2 to 4 percent slopes

#### Setting

*Landform:* Moraines  
*Slope:* 2 to 4 percent  
*Elevation:* 2,700 to 3,100 feet  
*Mean annual precipitation:* 14 to 18 inches  
*Frost-free period:* 105 to 135 days

#### Composition

##### Major Components

Post and similar soils: 85 percent

##### Minor Components

Ronan and similar soils: 0 to 5 percent  
Post cobbly silty clay loam: 0 to 5 percent  
Areas of water: 0 to 3 percent  
Somewhat poorly drained soils: 0 to 2 percent

#### Major Component Description

*Surface layer texture:* Silty clay loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Till  
*Flooding:* None  
*Sodium affected:* Sodic within 30 inches  
*Available water capacity:* Mainly 7.6 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

#### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

### 135--Post silty clay loam, 4 to 8 percent slopes

#### Setting

*Landform:* Moraines  
*Slope:* 4 to 8 percent  
*Elevation:* 2,700 to 3,100 feet  
*Mean annual precipitation:* 14 to 18 inches  
*Frost-free period:* 105 to 135 days

#### Composition

##### Major Components

Post and similar soils: 85 percent

##### Minor Components

Ronan and similar soils: 0 to 5 percent  
Post cobbly silty clay loam: 0 to 5 percent  
Areas of water: 0 to 3 percent  
Somewhat poorly drained soils: 0 to 2 percent

#### Major Component Description

*Surface layer texture:* Silty clay loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Till  
*Flooding:* None  
*Sodium affected:* Sodic within 30 inches  
*Available water capacity:* Mainly 7.7 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

#### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## 136--Post-Ronan-Water complex, 2 to 8 percent slopes

### Setting

#### *Landform:*

- \* Post--Lake plains
- \* Ronan--Lake plains

#### *Position on landform:*

- \* Post--Foot slopes
- \* Ronan--Shoulders and summits

#### *Slope:*

- \* Post--2 to 8 percent
- \* Ronan--2 to 8 percent

*Elevation:* 2,850 to 3,200 feet

*Mean annual precipitation:* 14 to 18 inches

*Frost-free period:* 105 to 130 days

### Composition

#### Major Components

Post and similar soils: 50 percent  
Ronan and similar soils: 20 percent  
Water: 20 percent

#### Minor Components

Ninepipe and similar soils: 0 to 4 percent  
Niarada and similar soils: 0 to 4 percent  
Bolack and similar soils: 0 to 2 percent

### Major Component Description

#### Post

*Surface layer texture:* Silt loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Glaciolacustrine deposits  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Sodium affected:* Sodic within 30 inches  
*Available water capacity:* Mainly 7.9 inches

#### Ronan

*Surface layer texture:* Silty clay loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Glaciolacustrine deposits  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Sodium affected:* Sodic within 30 inches  
*Available water capacity:* Mainly 6.2 inches

#### Water

*Definition:* Areas of open water

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## 137--Post-Ronan-Water complex, 8 to 15 percent slopes

### Setting

#### *Landform:*

- \* Post--Lake plains
- \* Ronan--Lake plains

#### *Position on landform:*

- \* Post--Foot slopes
- \* Ronan--Shoulders and summits

#### *Slope:*

- \* Post--8 to 15 percent
- \* Ronan--8 to 15 percent

*Elevation:* 2,850 to 3,200 feet

*Mean annual precipitation:* 14 to 18 inches

*Frost-free period:* 105 to 130 days

### Composition

#### Major Components

Post and similar soils: 35 percent  
Ronan and similar soils: 30 percent  
Water: 20 percent

#### Minor Components

Ninepipe and similar soils: 0 to 4 percent  
Niarada and similar soils: 0 to 4 percent  
Post cobbly silt loam: 0 to 3 percent  
Bolack and similar soils: 0 to 2 percent

### Major Component Description

#### Post

*Surface layer texture:* Silt loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained

*Dominant parent material:* Glaciolacustrine deposits

*Native plant cover type:* Rangeland

*Flooding:* None

*Sodium affected:* Sodic within 30 inches

*Available water capacity:* Mainly 7.9 inches

### **Ronan**

*Surface layer texture:* Silty clay loam

*Depth class:* Very deep (more than 60 inches)

*Drainage class:* Well drained

*Dominant parent material:* Glaciolacustrine deposits

*Native plant cover type:* Rangeland

*Flooding:* None

*Sodium affected:* Sodic within 30 inches

*Available water capacity:* Mainly 6.2 inches

### **Water**

*Definition:* Areas of open water

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

## **Management**

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## **Repp Series**

Repp series consists of very deep, well drained soils on mountain slopes. These soils formed in colluvium derived from argillite. Slope is 30 to 60 percent. Elevation is 2,900 to 4,600 feet. The average annual precipitation is 17 to 25 inches, average annual air temperature is 42 to 45 degrees F, and the frost-free period is 90 to 105 days.

**Taxonomic Class:** Loamy-skeletal, mixed, frigid Typic Ustochrepts

## **Typical Pedon**

Repp gravelly loam, in an area of Repp, cool-Rock outcrop complex, 30 to 60 percent slopes, in woodland; approximately 100 feet south and 10 feet east of the northwest corner of sec. 3, T. 22 N., R. 19 W.

Oi--2 inches to 0; undecomposed needles and twigs.

E--0 to 12 inches; light brownish gray (2.5Y 6/2) gravelly loam, olive brown (2.5Y 4/3) moist; weak medium granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine, fine, and medium roots; many very fine and fine tubular pores; 20 percent pebbles; mildly alkaline; gradual wavy boundary.

Bw--12 to 25 inches; pale brown (10YR 6/3) very gravelly loam, brown (10YR 4/3) moist; weak fine granular structure; soft, very friable, slightly sticky and slightly plastic; common very fine, fine, and medium roots; common very fine and fine tubular pores; 35 percent pebbles and 10 percent cobbles; strongly effervescent; mildly alkaline; gradual wavy boundary.

Bk--25 to 60 inches; light gray (2.5Y 7/2) extremely gravelly loam, light olive brown (2.5Y 5/3) moist; massive; soft, very friable, slightly sticky and slightly plastic; few fine and medium roots; few very fine and fine pores; 60 percent pebbles and 10 percent cobbles; violently effervescent; moderately alkaline.

## **Range in Characteristics**

*Soil temperature:* 44 to 47 degrees F

*Moisture control section:* Between 8 and 24 inches

*Content of clay in the control section:* 10 to 20 percent

*Depth to Bk horizon:* 13 to 36 inches

### *E horizon*

Hue: 10YR or 2.5Y

Value: 5, 6, or 7 dry; 4 or 5 moist

Chroma: 2 or 3

Clay content: 10 to 20 percent

Content of rock fragments: 20 to 50 percent--0 to 10 percent cobbles and stones, 20 to 50 percent pebbles

Reaction: pH 6.1 to 7.8

### *Bw horizon*

Hue: 10YR or 2.5Y

Value: 5, 6, or 7 dry; 4 or 5 moist  
Chroma: 2, 3, or 4  
Clay content: 10 to 20 percent  
Content of rock fragments: 35 to 60 percent--0  
to 10 percent cobbles, 35 to 50 percent  
pebbles  
Calcium carbonate equivalent: 5 to 10 percent  
Reaction: pH 7.4 to 8.4

*Bk horizons*

Hue: 10YR or 2.5Y  
Value: 6, 7, or 8 dry; 4, 5, or 6 moist  
Chroma: 2 or 3  
Clay content: 10 to 18 percent  
Content of rock fragments: 60 to 85 percent--0  
to 10 percent cobbles, 60 to 75 pebbles  
Calcium carbonate equivalent: 10 to 15  
percent  
Reaction: pH 7.4 to 9.0

**138--Repp gravelly loam, 30 to 60  
percent slopes**

**Setting**

*Landform:* Mountains  
*Slope:* 30 to 60 percent  
*Elevation:* 2,900 to 3,600 feet  
*Mean annual precipitation:* 17 to 22 inches  
*Frost-free period:* 90 to 105 days

**Composition**

**Major Components**

Repp and similar soils: 85 percent

**Minor Components**

Kingspoint and similar soils: 0 to 5 percent  
Repp, shallow to rock: 0 to 5 percent  
Areas of rock outcrop: 0 to 5 percent

**Major Component Description**

*Surface layer texture:* Gravelly loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Colluvium  
*Native plant cover type:* Forest land  
*Flooding:* None  
*Available water capacity:* Mainly 3.5 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

**Management**

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Forest Land" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

**139--Repp, cool-Rock outcrop complex,  
30 to 60 percent slopes**

**Setting**

*Landform:*

- \* Repp--Mountains
- \* Rock outcrop--Mountains

*Position on landform:*

- \* Repp--Back slopes and foot slopes
- \* Rock outcrop--Shoulders and summits

*Slope:*

- \* Repp--30 to 60 percent
- \* Rock outcrop--30 to 60 percent

*Elevation:* 3,000 to 4,600 feet

*Mean annual precipitation:* 20 to 25 inches

*Frost-free period:* 90 to 105 days

**Composition**

**Major Components**

Repp and similar soils: 75 percent  
Rock outcrop: 15 percent

**Minor Components**

Kingspoint and similar soils: 0 to 5 percent  
Repp shallow to rock: 0 to 5 percent

**Major Component Description**

**Repp**

*Surface layer texture:* Gravelly loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Colluvium  
*Native plant cover type:* Forest land  
*Flooding:* None  
*Available water capacity:* Mainly 4.4 inches

**Rock outcrop**

*Definition:* Exposures of bare bedrock  
*Dominant parent material:* Argillite residuum

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Forest Land" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## 140--Rock outcrop-Rubble land complex

### Composition

#### Major Components

Rock outcrop: 70 percent

Rubble land: 30 percent

### Major Component Description

#### Rock outcrop

*Definition:* Exposures of bare bedrock

#### Rubble land

*Definition:* Areas that have more than 90 percent of the surface covered by stones and boulders

### Ronan Series

Ronan series consists of very deep, well drained soils on dissected lake plains. These soils formed in glaciolacustrine deposits. Slope is 0 to 18 percent. Elevation is 2,500 to 3,200 feet. The average annual precipitation is 12 to 16 inches, average annual air temperature is 40 to 45 degrees F, and the frost-free period is 105 to 130 days.

**Taxonomic Class:** Very-fine, illitic, frigid Typic Natrixeralfs

### Typical Pedon

Ronan silty clay loam, 2 to 4 percent slopes, in cropland; approximately 1,110 feet south and 110 feet west of the northeast corner of sec. 23, T. 19 N., R. 21 W.

Ap--0 to 4 inches; light brownish gray (10YR 6/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; moderate fine platy structure; soft, very friable, slightly sticky and slightly plastic; many very fine roots; few very fine pores; neutral; abrupt wavy boundary.

Btn1--4 to 7 inches; pinkish gray (7.5YR 6/2) clay, brown (7.5YR 4/2) moist; strong coarse columnar structure parting to strong coarse and medium angular blocky; extremely hard, very firm, very sticky and very plastic; few very fine roots; many very fine pores; common distinct clay films on faces of peds; moderately alkaline; abrupt wavy boundary.

Btn2--7 to 16 inches; pinkish gray (7.5YR 6/2) clay, brown (7.5YR 4/2) moist; strong coarse and medium angular blocky structure; very hard, very firm, very sticky and very plastic; few very fine roots; many very fine pores; common distinct clay films on faces of peds; strongly alkaline; clear irregular boundary.

Bkn1--16 to 24 inches; pinkish white (7.5YR 8/2) and pinkish gray (7.5YR 6/2) clay, brown (7.5YR 5/2) moist; massive; 1/4- to 1/2-inch thick varves; very hard, firm, very sticky and very plastic; few very fine pores; disseminated lime; few to common fine threads and masses of lime between platy varves; strongly effervescent; strongly alkaline; gradual irregular boundary.

BC--24 to 60 inches; pinkish white (7.5YR 8/2) and pinkish gray (7.5YR 6/2) clay, brown (7.5YR 5/2) moist; massive; 1/4- to 1/2-inch thick varves; very hard, firm, very sticky and very plastic; disseminated lime; strongly effervescent; strongly alkaline.

### Range in Characteristics

*Soil temperature:* 42 to 47 degrees F

*Moisture control section:* Between 4 and 12 inches

*Content of clay in the control section:* 60 to 80 percent

*Depth to Bkn horizon:* 12 to 22 inches

*Depth to varves:* 18 to 33 inches

*Ap horizon*

Hue: 7.5YR or 10YR  
Value: 6 or 7 dry; 3 or 4 moist  
Chroma: 2 or 3  
Clay content: 30 to 40 percent  
Content of rock fragments: 0 to 15 percent--0  
to 5 percent cobbles, 0 to 10 percent  
pebbles  
Sodium adsorption ratio: 2 to 8  
Reaction: pH 6.6 to 7.8

*Btn1 horizon*

Hue: 10YR or 7.5YR  
Value: 6, 7, or 8 dry; 4, 5, or 6 moist  
Chroma: 2, 3, or 4  
Clay content: 60 to 70 percent  
Content of rock fragments: 0 to 15 percent--0  
to 5 percent cobbles, 0 to 10 percent  
pebbles  
Sodium adsorption ratio: 6 to 13  
Reaction: pH 7.4 to 8.4

*Btn2 horizon*

Hue: 10YR or 7.5YR  
Value: 6, 7, or 8 dry; 4, 5, or 6 moist  
Chroma: 2, 3, or 4  
Clay content: 60 to 80 percent  
Content of rock fragments: 0 to 15 percent--0  
to 5 percent cobbles, 0 to 10 percent  
pebbles  
Electrical conductivity: 0 to 4 mmhos/cm  
Sodium adsorption ratio: 13 to 22  
Reaction: pH 8.5 to 9.0

*Bkn horizon*

Hue: 10YR or 7.5YR  
Value: 6, 7, or 8 dry; 4, 5, or 6 moist  
Chroma: 2, 3, or 4  
Texture: Silty clay or clay  
Clay content: 50 to 75 percent  
Content of rock fragments: 0 to 15 percent--0  
to 5 percent cobbles, 0 to 10 percent  
pebbles  
Calcium carbonate equivalent: 8 to 15 percent  
Electrical conductivity: 2 to 8 mmhos/cm  
Sodium adsorption ratio: 8 to 30  
Reaction: pH 8.5 to 9.0

*BC horizon*

Hue: 10YR or 7.5YR  
Value: 6, 7, or 8 dry; 4, 5, or 6 moist  
Chroma: 2, 3, or 4  
Texture: Silty clay or clay  
Clay content: 50 to 75 percent  
Content of rock fragments: 0 to 15 percent--0  
to 5 percent cobbles, 0 to 10 percent  
pebbles

Calcium carbonate equivalent: 8 to 15 percent  
Electrical conductivity: 2 to 8 mmhos/cm  
Sodium adsorption ratio: 2 to 8  
Reaction: pH 8.5 to 9.0

## **141--Ronan silty clay loam, 0 to 2 percent slopes**

### **Setting**

*Landform:* Lake plains  
*Slope:* 0 to 2 percent  
*Elevation:* 2,500 to 3,200 feet  
*Mean annual precipitation:* 12 to 16 inches  
*Frost-free period:* 110 to 130 days

### **Composition**

#### **Major Components**

Ronan and similar soils: 85 percent

#### **Minor Components**

Post and similar soils: 0 to 10 percent  
Esteslake and similar soils: 0 to 5 percent

### **Major Component Description**

*Surface layer texture:* Silty clay loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Glaciolacustrine  
deposits  
*Flooding:* None  
*Sodium affected:* Sodic within 30 inches  
*Available water capacity:* Mainly 6.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### **Management**

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## 142--Ronan silty clay loam, 2 to 4 percent slopes

### Setting

*Landform:* Lake plains  
*Slope:* 2 to 4 percent  
*Elevation:* 2,500 to 3,200 feet  
*Mean annual precipitation:* 12 to 16 inches  
*Frost-free period:* 110 to 130 days

### Composition

#### Major Components

Ronan and similar soils: 85 percent

#### Minor Components

Post and similar soils: 0 to 5 percent  
Irvine and similar soils: 0 to 5 percent  
Esteslake and similar soils: 0 to 5 percent

### Major Component Description

*Surface layer texture:* Silty clay loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Glaciolacustrine deposits  
*Flooding:* None  
*Sodium affected:* Sodic within 30 inches  
*Available water capacity:* Mainly 6.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## 143--Ronan silty clay loam, 4 to 8 percent slopes

### Setting

*Landform:* Lake plains

*Slope:* 4 to 8 percent  
*Elevation:* 2,500 to 3,200 feet  
*Mean annual precipitation:* 12 to 16 inches  
*Frost-free period:* 110 to 130 days

### Composition

#### Major Components

Ronan and similar soils: 85 percent

#### Minor Components

Bolack soils: 0 to 5 percent  
Irvine and similar soils: 0 to 5 percent  
Post and similar soils: 0 to 5 percent

### Major Component Description

*Surface layer texture:* Silty clay loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Glaciolacustrine deposits  
*Flooding:* None  
*Sodium affected:* Sodic within 30 inches  
*Available water capacity:* Mainly 6.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

### Round Butte Series

Round Butte series consist of very deep, well drained soils on lake plains. These soils formed in strongly alkaline, varved, clayey lacustrine deposits. Slope is 0 to 15 percent. Elevation is 2,500 to 3,000 feet. The average annual precipitation is 10 to 14 inches, average annual air temperature is 40 to 45 degrees F, and the frost-free period is 105 to 130 days.

**Taxonomic Class:** Fine, illitic, frigid Typic Natrixeralfs

### Typical Pedon

Round Butte silty clay loam, 0 to 2 percent slopes, in an area of cropland; 550 feet north and 1,430 feet west of the southeast corner of sec. 27, T. 22 N., R. 21 W.

Ap--0 to 7 inches; light brownish gray (10YR 6/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; weak thick platy structure; very hard, friable, slightly sticky and slightly plastic; many very fine and fine roots; many very fine tubular pores; many clean unstained sand grains; neutral; abrupt wavy boundary.

Btn1--7 to 11 inches; pale brown (10YR 6/3) clay, brown (10YR 5/3) moist; strong medium prismatic structure parting to strong medium subangular blocky; very hard, firm, sticky and very plastic; many fine and very fine roots along faces of peds; common very fine and fine tubular pores; continuous distinct brown (10YR 4/3) clay films on faces of peds and in pores; few prominent very dark grayish brown (10YR 3/2) organic films on faces of peds; strongly alkaline; gradual wavy boundary.

Btn2--11 to 14 inches; light yellowish brown (10YR 6/4) clay, brown (10YR 5/3) moist; weak coarse prismatic structure parting to moderate medium subangular blocky; very hard, firm, sticky and very plastic; many fine roots along faces of peds; few very fine and fine tubular pores; common distinct dark grayish brown (10YR 4/2) clay films on faces of peds and in pores; few distinct very dark brown (10YR 2/2) organic films on faces of peds; slightly effervescent; strongly alkaline; clear wavy boundary.

Bkn--14 to 21 inches; very pale brown (10YR 7/3) silty clay, brown (10YR 5/3) moist; massive; 1/8- to 1/4-inch thick weathered varves; very hard, firm, sticky and very plastic; few fine roots in widely spaced vertical cracks; few very fine and fine pores; strongly effervescent; disseminated and common soft medium lime masses and common fine seams of lime between varves; strongly alkaline; gradual wavy boundary.

C1--21 to 44 inches; very pale brown (10YR 7/3) silty clay, brown (10YR 5/3) moist; massive; 1/4- to 1/2-inch thick unweathered varves; very hard, firm, sticky and very plastic; alternating varves of very pale brown (10YR 7/3) clay and white (10YR 8/2) silt loam; few

fine and very fine roots in widely spaced vertical cracks; slightly effervescent; strongly alkaline; abrupt smooth boundary.

C2--44 to 60 inches; very pale brown (10YR 7/3) alternating thick strata of silty clay and silt, brown (10YR 5/3) moist; massive; alternating strata of 1/4- to 1/2-inch thick unweathered varves of silty clay and 8-inch thick varves of silt loam; hard and soft, firm and very friable, sticky and nonsticky and very plastic and nonplastic, respectively; slightly effervescent; very strongly alkaline.

### Range in Characteristics

*Soil temperature:* 42 to 47 degrees F

*Moisture control section:* Between 4 to 12 inches; dry in all parts more than half the time (cumulative) during April through September and never moist in some or all parts for as long as 90 consecutive days during May through August

*Control section:* 35 to 60 percent clay and less than 10 percent coarser than very fine sand

*Depth to Bkn horizon:* 10 to 20 inches

*Depth to varves:* Weathered--10 to 20 inches; unweathered--15 to 30 inches

#### *Ap horizon*

Value: 6 or 7 dry; 3, 4, or 5 moist

Chroma: 2 or 3

Clay content: 27 to 35 percent

Electrical conductivity: Less than 2 mmhos/cm

Sodium adsorption ratio: 3 to 13

Reaction: Greater than pH 6.5

#### *Btn1 horizon*

Value: 6 or 7 dry; 4 or 5 moist

Chroma: 2, 3, or 4

Texture: Clay, silty clay, or silty clay loam

Clay content: 35 to 60 percent

Electrical conductivity: Less than 4 mmhos/cm

Sodium adsorption ratio: 13 to 40

Reaction: Greater than pH 7.8

#### *Btn2 horizon*

Value: 6 or 7 dry; 4 or 5 moist

Chroma: 3 or 4

Texture: Clay, silty clay, or silty clay loam

Clay content: 35 to 60 percent

Electrical conductivity: Less than 4 mmhos/cm

Sodium adsorption ratio: 13 to 60

Reaction: Greater than pH 7.8

#### *Bkn horizon*

Value: 7 or 8 dry; 5 or 6 moist

Chroma: 3 or 4

Texture: Clay, silty clay, or silty clay loam

Clay content: 35 to 55 percent

Calcium carbonate equivalent: 8 to 15 percent  
Electrical conductivity: Less than 4 mmhos/cm  
Sodium adsorption ratio: 13 to 60  
Reaction: Greater than pH 7.8

*C1 horizon*

Value: 6 or 7 dry; 4, 5, or 6 moist  
Chroma: 3 or 4  
Texture: Clay, silty clay, or silty clay loam  
Clay content: 35 to 55 percent  
Electrical conductivity: Less than 4 mmhos/cm  
Sodium adsorption ratio: 13 to 60  
Reaction: Greater than pH 7.8

*C2 horizon*

Value: 6 or 7 dry; 4, 5, or 6 moist  
Chroma: 3 or 4  
Texture: Strata of silty clay and clay varves  
and strata of silt and silt loam  
Clay content: 30 to 50 percent--35 to 55  
percent clay in the varved strata, 5 to 12  
percent clay in the silt strata  
Electrical conductivity: Less than 4 mmhos/cm  
Sodium adsorption ratio: 13 to 60  
Reaction: greater than pH 7.8

**144--Round Butte silty clay loam, 0 to 2 percent slopes**

**Setting**

*Landform:* Lake plains  
*Slope:* 0 to 2 percent  
*Elevation:* 2,500 to 3,000 feet  
*Mean annual precipitation:* 10 to 14 inches  
*Frost-free period:* 105 to 130 days

**Composition**

**Major Components**

Round Butte and similar soils: 85 percent

**Minor Components**

Lonepine and similar soils: 0 to 5 percent  
Ronan and similar soils: 0 to 5 percent  
Marklepass and similar soils: 0 to 5 percent

**Major Component Description**

*Surface layer texture:* Silty clay loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Lacustrine deposits  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Sodium affected:* Sodic within 30 inches  
*Available water capacity:* Mainly 5.4 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

**Management**

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

**145--Round Butte silty clay loam, 2 to 4 percent slopes**

**Setting**

*Landform:* Lake plains  
*Slope:* 2 to 4 percent  
*Elevation:* 2,500 to 3,000 feet  
*Mean annual precipitation:* 10 to 14 inches  
*Frost-free period:* 105 to 130 days

**Composition**

**Major Components**

Round Butte and similar soils: 85 percent

**Minor Components**

Lonepine and similar soils: 0 to 5 percent  
Ronan and similar soils: 0 to 5 percent  
Irvine and similar soils: 0 to 3 percent  
Marklepass and similar soils: 0 to 2 percent

**Major Component Description**

*Surface layer texture:* Silty clay loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Lacustrine deposits  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Sodium affected:* Sodic within 30 inches  
*Available water capacity:* Mainly 5.4 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is

available in the "Soil Properties" section, Part II, of this publication.

### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

### 146--Round Butte silty clay loam, 4 to 8 percent slopes

#### Setting

*Landform:* Lake plains  
*Slope:* 4 to 8 percent  
*Elevation:* 2,500 to 3,000 feet  
*Mean annual precipitation:* 10 to 14 inches  
*Frost-free period:* 105 to 130 days

#### Composition

##### Major Components

Round Butte and similar soils: 85 percent

##### Minor Components

Irvine and similar soils: 0 to 4 percent  
Belton and similar soils: 0 to 4 percent  
Marklepass and similar soils: 0 to 4 percent  
Somewhat poorly drained soils: 0 to 3 percent

#### Major Component Description

*Surface layer texture:* Silty clay loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Lacustrine deposits  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Sodium affected:* Sodic within 30 inches  
*Available water capacity:* Mainly 5.4 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

### 147--Round Butte silty clay loam, dry, 0 to 2 percent slopes

#### Setting

*Landform:* Lake plains  
*Slope:* 0 to 2 percent  
*Elevation:* 2,500 to 3,000 feet  
*Mean annual precipitation:* 10 to 12 inches  
*Frost-free period:* 105 to 130 days

#### Composition

##### Major Components

Round Butte and similar soils: 85 percent

##### Minor Components

Marklepass and similar soils: 0 to 10 percent  
Dryfork and similar soils: 0 to 5 percent

#### Major Component Description

*Surface layer texture:* Silty clay loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Lacustrine deposits  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Sodium affected:* Sodic within 30 inches  
*Available water capacity:* Mainly 5.4 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## 148--Round Butte-Irvine silty clay loams, 2 to 8 percent slopes

### Setting

#### *Landform:*

- \* Round Butte--Lake plains
- \* Irvine--Lake plains

#### *Position on landform:*

- \* Round Butte--Foot slopes and toe slopes
- \* Irvine--Back slopes and shoulders

#### *Slope:*

- \* Round Butte--2 to 8 percent
- \* Irvine--4 to 8 percent

*Elevation:* 2,500 to 3,000 feet

*Mean annual precipitation:* 12 to 14 inches

*Frost-free period:* 105 to 120 days

### Composition

#### Major Components

Round Butte and similar soils: 60 percent  
Irvine and similar soils: 25 percent

#### Minor Components

Esteslake and similar soils: 0 to 5 percent  
Areas of slickspots: 0 to 5 percent  
Moderately well drained soils: 0 to 5 percent

### Major Component Description

#### Round Butte

*Surface layer texture:* Silty clay loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Lacustrine deposits  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Sodium affected:* Sodic within 30 inches  
*Available water capacity:* Mainly 5.4 inches

#### Irvine

*Surface layer texture:* Silty clay loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Lacustrine deposits  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 5.5 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## 149--Round Butte-Irvine silty clay loams, dry, 4 to 15 percent slopes

### Setting

#### *Landform:*

- \* Round Butte--Lake plains
- \* Irvine--Lake plains

#### *Position on landform:*

- \* Round Butte--Foot slopes and toe slopes
- \* Irvine--Back slopes and shoulders

#### *Slope:*

- \* Round Butte--4 to 15 percent
- \* Irvine--4 to 15 percent

*Elevation:* 2,500 to 3,000 feet

*Mean annual precipitation:* 12 to 14 inches

*Frost-free period:* 105 to 120 days

### Composition

#### Major Components

Round Butte and similar soils: 60 percent  
Irvine and similar soils: 25 percent

#### Minor Components

Marklepass and similar soils: 0 to 8 percent  
Moderately well drained soils: 0 to 7 percent

### Major Component Description

#### Round Butte

*Surface layer texture:* Silty clay loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained

*Dominant parent material:* Lacustrine deposits  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Sodium affected:* Sodic within 30 inches  
*Available water capacity:* Mainly 5.4 inches

#### **Irvine**

*Surface layer texture:* Silty clay loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Lacustrine deposits  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 5.5 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### **Management**

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

### **Rumblecreek Series**

Rumblecreek series consists of very deep, well drained soils on moraines and mountain slopes. These soils formed in loamy alpine till. Slope is 2 to 60 percent. Elevation is 3,000 to 4,800 feet. The average annual precipitation is 25 to 35 inches, average annual air temperature is 40 to 45 degrees F, and the frost-free period is 60 to 90 days.

**Taxonomic Class:** Loamy-skeletal, mixed Glosic Entroboralfs

#### **Typical Pedon**

Rumblecreek gravelly loam, 30 to 60 percent slopes, in an area of woodland; 1,600 feet east and 1,600 feet north of the southwest corner of sec. 24, T. 26 N., R. 19 W.

Oe--3 inches to 0; decomposed needles and twigs.

E1--0 to 5 inches; pale brown (10YR 6/3) gravelly loam, dark grayish brown (10YR 4/2) moist; weak fine granular structure; soft, very friable, slightly sticky and nonplastic; many fine and medium roots; many fine and medium pores; 25 percent pebbles; medium acid; clear smooth boundary.

E2--5 to 12 inches; very pale brown (10YR 7/3) gravelly loam, brown (10YR 5/3) moist; weak fine granular structure; soft, very friable, slightly sticky and nonplastic; many fine and medium roots; many fine pores; 30 percent pebbles; medium acid; clear wavy boundary.

E/Bt--12 to 18 inches; 60 percent is very pale brown (10YR 7/3) gravelly loam, pale brown (10YR 6/3) moist (E part); 40 percent is yellowish brown (10YR 5/6) gravelly clay loam, brown (10YR 4/3) moist (Bt part); weak fine and medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common fine roots; common fine pores; 25 percent pebbles and 5 percent cobbles; medium acid; gradual wavy boundary.

Bt/E--18 to 22 inches; 65 percent is yellowish brown (10YR 5/6) very gravelly clay loam, pale brown (10YR 4/3) moist (Bt part); 35 percent is very pale brown (10YR 7/3) very gravelly loam, pale brown (10YR 6/3) moist (E part); moderate fine and medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common fine roots; common fine pores; 35 percent pebbles and 10 percent cobbles; common faint clay films on faces of peds; slightly acid; gradual smooth boundary.

Bt--22 to 60 inches; light yellowish brown (10YR 6/4) very gravelly clay loam, yellowish brown (10YR 5/4) moist; moderate medium subangular blocky structure; hard, friable, sticky and plastic; common fine roots; common fine pores; 35 percent pebbles and 10 percent cobbles; common distinct clay films on faces of peds; slightly acid.

### **Range in Characteristics**

*Soil temperature:* 40 to 46 degrees F

*Moisture control section:* Between 4 and 12 inches

*Depth to argillic horizon:* 10 to 22 inches

#### *E horizons*

Hue: 10YR or 7.5YR

Value: 6 or 7 dry; 4, 5, or 6 moist

Chroma: 2 or 3

Clay content: 10 to 20 percent  
Content of rock fragments: 15 to 35 percent--0  
to 5 percent cobbles, 15 to 30 percent  
pebbles  
Reaction: pH 5.1 to 7.3

*Bt/E horizon*

Hue: B part--10YR or 7.5YR; E part--10YR or  
7.5YR  
Value: B part--5 or 6 dry and 4 or 5 moist; E  
part--6 or 7 dry and 5 or 6 moist  
Chroma: B part--3, 4, or 6; E part--2 or 3  
Texture (mixed): Loam, clay loam, or sandy  
clay loam  
Clay content, mixed: 20 to 35 percent  
Content of rock fragments: 35 to 60 percent--0  
to 10 percent cobbles, 35 to 50 percent  
pebbles  
Reaction: pH 5.6 to 6.5

*Bt horizon*

Hue: 10YR or 7.5YR  
Value: 5 or 6 dry; 4 or 5 moist  
Chroma: 3, 4, or 6  
Texture: Clay loam or sandy clay loam  
Clay content: 20 to 35 percent  
Content of rock fragments: 35 to 60 percent--0  
to 10 percent cobbles, 35 to 50 percent  
pebbles  
Reaction: pH 5.6 to 6.5

**150--Rumblecreek gravelly loam, 2 to 8  
percent slopes**

**Setting**

*Landform:* Moraines  
*Slope:* 2 to 8 percent  
*Elevation:* 3,000 to 4,100 feet  
*Mean annual precipitation:* 25 to 30 inches  
*Frost-free period:* 60 to 90 days

**Composition**

**Major Components**

Rumblecreek and similar soils: 85 percent

**Minor Components**

Courville and similar soils: 0 to 4 percent  
Connah and similar soils: 0 to 4 percent  
Mollman and similar soils: 0 to 3 percent  
Poorly drained soils: 0 to 2 percent

**Major Component Description**

*Surface layer texture:* Gravelly loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained

*Dominant parent material:* Alpine till  
*Native plant cover type:* Forest land  
*Flooding:* None  
*Available water capacity:* Mainly 5.6 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

**Management**

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Forest Land" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

**151--Rumblecreek gravelly loam, 8 to 15  
percent slopes**

**Setting**

*Landform:* Moraines  
*Slope:* 8 to 15 percent  
*Elevation:* 3,400 to 4,800 feet  
*Mean annual precipitation:* 25 to 35 inches  
*Frost-free period:* 60 to 90 days

**Composition**

**Major Components**

Rumblecreek and similar soils: 85 percent

**Minor Components**

Courville and similar soils: 0 to 10 percent  
Mollman and similar soils: 0 to 5 percent

**Major Component Description**

*Surface layer texture:* Gravelly loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Alpine till  
*Native plant cover type:* Forest land  
*Flooding:* None  
*Available water capacity:* Mainly 5.5 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Forest Land" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

### 152--Rumblecreek gravelly loam, 15 to 30 percent slopes

#### Setting

*Landform:* Moraines  
*Slope:* 15 to 30 percent  
*Elevation:* 3,000 to 4,000 feet  
*Mean annual precipitation:* 25 to 35 inches  
*Frost-free period:* 60 to 90 days

#### Composition

##### Major Components

Rumblecreek and similar soils: 85 percent

##### Minor Components

Courville and similar soils: 0 to 5 percent  
Tevis and similar soils: 0 to 5 percent  
Areas of rock outcrop: 0 to 5 percent

#### Major Component Description

*Surface layer texture:* Gravelly loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Alpine till  
*Native plant cover type:* Forest land  
*Flooding:* None  
*Available water capacity:* Mainly 5.5 inches

A typical soil description with range in characteristics is included, in alphabetical order, in

this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Forest Land" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

### 153--Rumblecreek gravelly loam, 30 to 60 percent slopes

#### Setting

*Landform:* Mountains  
*Slope:* 30 to 60 percent  
*Elevation:* 3,200 to 4,800 feet  
*Mean annual precipitation:* 25 to 35 inches  
*Frost-free period:* 60 to 90 days

#### Composition

##### Major Components

Rumblecreek and similar soils: 90 percent

##### Minor Components

Courville and similar soils: 0 to 10 percent

#### Major Component Description

*Surface layer texture:* Gravelly loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Alpine till  
*Native plant cover type:* Forest land  
*Flooding:* None  
*Available water capacity:* Mainly 5.5 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

## Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Forest Land" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## Sacheen Series

Sacheen series consists of very deep, somewhat excessively drained soils on stream terraces and sand dunes. These soils formed in glaciofluvial or eolian deposits. Slope is 0 to 10 percent. Elevation is 2,700 to 3,300 feet. The average annual precipitation is 15 to 20 inches, average annual air temperature is 41 to 45 degrees F, and the frost-free period is 105 to 120 days.

**Taxonomic Class:** Mixed, frigid Typic Xeropsamments

## Typical Pedon

Sacheen loamy fine sand, 0 to 8 percent slopes, in an area of woodland; 130 feet south and 1,285 feet west of the northeast corner of sec. 1, T. 21 N., R. 20 W.

Oe--1 inch to 0; partially decomposed needles and twigs.

A--0 to 3 inches; brown (10YR 5/3) loamy fine sand, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure; soft, very friable, nonsticky and nonplastic; many fine roots; many fine pores; slightly acid; clear wavy boundary.

AC--3 to 9 inches; pale brown (10YR 6/3) loamy fine sand, brown (10YR 4/3) moist; weak medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; many fine roots; many fine pores; slightly acid; gradual irregular boundary.

C1--9 to 36 inches; very pale brown (10YR 7/3) loamy fine sand, pale brown (10YR 6/3) moist; single grain; loose, nonsticky and nonplastic; common fine roots; common fine pores; 5 percent pebbles; slightly acid; clear irregular boundary.

C2--36 to 60 inches; very pale brown (10YR 7/3) loamy fine sand, pale brown (10YR 6/3) moist; single grain; loose, nonsticky and nonplastic; few fine roots; few fine pores; few small brown (10YR 5/3) sandy loam nodules; 5 percent pebbles; slightly acid.

## Range in Characteristics

*Moisture control section:* Between 12 and 35 inches

### *A horizon*

Hue: 10YR or 2.5Y

Value: 3, 4, 5, or 6 dry; 2, 3, or 4 moist

Chroma: 1, 2, or 3

Texture: Loamy fine sand or fine sand

Clay content: 3 to 8 percent

Content of rock fragments: 0 to 15 percent

Reaction: pH 6.1 to 7.3

### *AC horizon*

Hue: 10YR or 2.5Y

Value: 5, 6, or 7 dry; 4, 5, or 6 moist

Chroma: 2, 3, or 4

Texture: Loamy fine sand or fine sand

Clay content: 3 to 8 percent

Content of rock fragments: 0 to 25 percent pebbles

Reaction: pH 6.1 to 7.3

### *C horizons*

Hue: 10YR or 2.5Y

Value: 5, 6, or 7 dry; 4, 5, or 6 moist

Chroma: 2, 3, or 4

Texture: Loamy fine sand or fine sand

Clay content: 3 to 8 percent

Content of rock fragments: 5 to 25 percent pebbles

Reaction: pH 6.1 to 7.3

## 154--Sacheen fine sand, hummocky, 3 to 10 percent slopes

### Setting

*Landform:* Sand dunes

*Slope:* 3 to 10 percent

*Elevation:* 2,700 to 3,300 feet

*Mean annual precipitation:* 15 to 20 inches

*Frost-free period:* 105 to 120 days

### Composition

#### Major Components

Sacheen and similar soils: 85 percent

### Minor Components

Sand dune areas: 0 to 10 percent

Blowout areas: 0 to 5 percent

### Major Component Description

*Surface layer texture:* Fine sand

*Depth class:* Very deep (more than 60 inches)

*Drainage class:* Somewhat excessively drained

*Dominant parent material:* Eolian deposits

*Native plant cover type:* Forest land

*Flooding:* None

*Available water capacity:* Mainly 6.0 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Forest Land" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## 155--Sacheen loamy fine sand, 0 to 8 percent slopes

### Setting

*Landform:* Sand dunes

*Slope:* 0 to 8 percent

*Elevation:* 2,700 to 3,300 feet

*Mean annual precipitation:* 15 to 20 inches

*Frost-free period:* 105 to 120 days

### Composition

#### Major Components

Sacheen and similar soils: 85 percent

#### Minor Components

McCollum and similar soils: 0 to 10 percent

Sacheen, gravelly substratum: 0 to 5 percent

### Major Component Description

*Surface layer texture:* Loamy fine sand

*Depth class:* Very deep (more than 60 inches)

*Drainage class:* Somewhat excessively drained

*Dominant parent material:* Eolian deposits

*Native plant cover type:* Forest land

*Flooding:* None

*Available water capacity:* Mainly 6.0 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Forest Land" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

### Selon Series

Selon series consists of very deep, well drained soils on stream terraces and alluvial fans. These soils formed in glaciofluvial deposits. Slope is 0 to 15 percent. Elevation is 3,000 to 3,400 feet. The average annual precipitation is about 17 to 24 inches, average annual air temperature is 40 to 45 degrees F, and the frost-free period is 105 to 120 days.

**Taxonomic Class:** Coarse-loamy, mixed, frigid Typic Xerochrepts

### Typical Pedon

Selon fine sandy loam, 2 to 4 percent slopes, in an area of woodland; approximately 2,500 feet south and 1,100 feet west of the northeast corner of sec. 29, T. 22 N., R. 19 W.

Oi--1 inch to 0; undecomposed and slightly decomposed forest litter.

A1--0 to 3 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine, fine, and medium roots; many very fine pores; slightly acid; clear smooth boundary.

A2--3 to 7 inches; grayish brown (10YR 5/2) fine sandy loam, dark brown (10YR 3/3) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine, fine, and medium roots; many fine pores; slightly acid; clear wavy boundary.

E--7 to 22 inches; pale brown (10YR 6/3) fine sandy loam, brown (10YR 4/3) moist; weak medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; many very fine, fine, and medium roots; many very fine tubular pores and common fine and medium tubular pores; slightly acid; clear smooth boundary.

E/Bw--22 to 39 inches; 80 percent is very pale brown (10YR 7/3) fine sandy loam, yellowish brown (10YR 5/4) moist (E part); 20 percent is yellowish brown (10YR 5/4) fine sandy loam, dark brown (10YR 4/3) moist (B part); has random small masses and discontinuous horizontal thin bands; massive; soft, very friable, nonsticky and nonplastic; common fine and medium roots; many very fine pores; slightly acid.

C--39 to 60 inches; very pale brown (10YR 7/3) fine sandy loam, yellowish brown (10YR 5/4); massive; soft, very friable, nonsticky and nonplastic; few fine and medium roots; slightly acid.

### Range in Characteristics

*Soil temperature:* 42 to 47 degrees F

*Control section:* 10 to 18 percent clay, 15 to 50 percent very fine sand and coarser, 0 to 15 percent pebbles

*Other features:* The dark colored surface of this soil does not meet thickness requirements for a mollic epipedon

#### *A horizons*

Hue: 10YR or 2.5Y

Value: 4, 5, or 6 dry; 2, 3, or 4 moist

Chroma: 2 or 3

Texture: Fine sandy loam or sandy loam

Clay content: 10 to 18 percent

Content of rock fragments: 0 to 15 percent pebbles

Reaction: pH 6.1 to 7.3

#### *E horizon*

Hue: 10YR or 2.5Y

Value: 5, 6, or 7 dry; 4, 5, or 6 moist

Chroma: 3 or 4

Clay content: 10 to 18 percent

Content of rock fragments: 0 to 15 percent pebbles

Reaction: pH 6.1 to 7.3

#### *E/Bw horizon*

Hue: 10YR or 2.5Y

Value: E part--5, 6, or 7 dry and 4, 5, or 6 moist; B part--4 or 5 dry and 4 or 5 moist

Chroma: E part--3 or 4; B part--3, 4, 5, or 6

Texture: E part--fine sandy loam; B part--sandy clay loam or sandy clay; mixed--fine sandy loam

Clay content: E part--10 to 18 percent; B part--20 to 40 percent; mixed--10 to 28 percent

Content of rock fragments: 0 to 15 percent pebbles

Reaction: pH 6.1 to 7.3

#### *C horizon*

Hue: 10YR or 2.5Y

Value: 5, 6, or 7 dry; 4, 5, or 6 moist

Chroma: 3 or 4

Clay content: 10 to 18 percent

Content of rock fragments: 0 to 15 percent pebbles

Reaction: pH 6.1 to 7.3

## 156--Selon fine sandy loam, 0 to 2 percent slopes

### Setting

*Landform:* Alluvial fans and stream terraces

*Slope:* 0 to 2 percent

*Elevation:* 3,000 to 3,400 feet

*Mean annual precipitation:* 17 to 24 inches

*Frost-free period:* 105 to 120 days

### Composition

#### Major Components

Selon and similar soils: 85 percent

#### Minor Components

McCullum and similar soils: 0 to 10 percent

Sacheen and similar soils: 0 to 5 percent

### Major Component Description

*Surface layer texture:* Fine sandy loam

*Depth class:* Very deep (more than 60 inches)

*Drainage class:* Well drained

*Dominant parent material:* Glaciofluvial deposits

*Native plant cover type:* Forest land  
*Flooding:* None  
*Available water capacity:* Mainly 8.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### **Management**

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Forest Land" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

### **157--Selon fine sandy loam, 2 to 4 percent slopes**

#### **Setting**

*Landform:* Alluvial fans and stream terraces  
*Slope:* 2 to 4 percent  
*Elevation:* 3,000 to 3,400 feet  
*Mean annual precipitation:* 17 to 24 inches  
*Frost-free period:* 105 to 120 days

#### **Composition**

##### **Major Components**

Selon and similar soils: 85 percent

##### **Minor Components**

McCullum and similar soils: 0 to 10 percent  
Sacheen and similar soils: 0 to 5 percent

#### **Major Component Description**

*Surface layer texture:* Fine sandy loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Glaciofluvial deposits  
*Native plant cover type:* Forest land  
*Flooding:* None  
*Available water capacity:* Mainly 8.1 inches

A typical soil description with range in

characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### **Management**

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Forest Land" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

### **158--Selon fine sandy loam, 4 to 8 percent slopes**

#### **Setting**

*Landform:* Stream terraces  
*Slope:* 4 to 8 percent  
*Elevation:* 3,000 to 3,400 feet  
*Mean annual precipitation:* 17 to 24 inches  
*Frost-free period:* 105 to 120 days

#### **Composition**

##### **Major Components**

Selon and similar soils: 85 percent

##### **Minor Components**

McCullum and similar soils: 0 to 10 percent  
Sacheen and similar soils: 0 to 5 percent

#### **Major Component Description**

*Surface layer texture:* Fine sandy loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Glaciofluvial deposits  
*Native plant cover type:* Forest land  
*Flooding:* None  
*Available water capacity:* Mainly 8.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

## Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Forest Land" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## 159--Selon sandy loam, 8 to 15 percent slopes

### Setting

*Landform:* Stream terraces

*Slope:* 8 to 15 percent

*Elevation:* 3,000 to 3,400 feet

*Mean annual precipitation:* 17 to 24 inches

*Frost-free period:* 105 to 120 days

### Composition

#### Major Components

Selon and similar soils: 85 percent

#### Minor Components

McCullum and similar soils: 0 to 3 percent

Sacheen and similar soils: 0 to 2 percent

Kingspoint and similar soils: 0 to 3 percent

Wildgen and similar soils: 0 to 3 percent

Yellowbay and similar soils: 0 to 3 percent

### Major Component Description

*Surface layer texture:* Sandy loam

*Depth class:* Very deep (more than 60 inches)

*Drainage class:* Well drained

*Dominant parent material:* Glaciofluvial deposits

*Native plant cover type:* Forest land

*Flooding:* None

*Available water capacity:* Mainly 8.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

## Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Forest Land" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## Selow Series

Selow series consists of very deep, well drained soils that formed in glaciolacustrine deposits. These soils are on dissected lake plains. Slopes are 0 to 15 percent. Elevation is 2,700 to 3,100 feet. The average annual precipitation is 10 to 14 inches, average annual air temperature is 41 to 45 degrees F, and the frost-free period is 105 to 120 days.

**Taxonomic Class:** Fine-silty, illitic, frigid Typic Natrixeralfs

### Typical Pedon

Selow silty clay loam, 2 to 4 percent slopes, in an area of cropland; approximately 2,340 feet east and 140 feet south of the northwest corner of sec. 26, T. 22 N., R. 21 W.

Ap--0 to 9 inches; light brownish gray (10YR 6/2) silty clay loam, dark grayish brown (10YR 4/2) moist; moderate medium subangular blocky structure parting to moderate fine and medium granular; slightly hard, friable, slightly sticky and slightly plastic; many medium and coarse roots; neutral; clear smooth boundary.

Btn--9 to 15 inches; very pale brown (10YR 7/3) silty clay loam, light yellowish brown (10YR 6/4) moist; weak medium prismatic structure parting to moderate fine and medium subangular blocky; hard, firm, sticky and plastic; common fine and medium roots; many fine tubular pores; common distinct clay films on faces of peds; slightly effervescent; moderately alkaline; clear wavy boundary.

Bkn--15 to 23 inches; very pale brown white

(10YR 7/3) silty clay loam, light yellowish brown (10YR 6/4) moist; massive; 1/8- to 1/2-inch thick varves; hard, firm, sticky and very plastic; common fine roots concentrated along vertical worm channels; common fine tubular pores; common fine and medium seams of lime between varves; strongly effervescent; strongly alkaline; clear wavy boundary.

2C1--23 to 47 inches; light brownish gray (10YR 6/2) silt loam, brown (10YR 5/3) moist; massive; soft, very friable, nonsticky and nonplastic; few very fine and fine roots; few fine tubular pores; mildly alkaline; clear wavy boundary.

2C2--47 to 60 inches; pale brown (10YR 6/3) loamy fine sand, brown (10YR 5/3) moist; single grain; loose, nonsticky and nonplastic; mildly alkaline.

### Range in Characteristics

*Soil temperature:* 43 to 47 degrees

*Moisture control section:* Between 4 and 12 inches

*Content of clay in the control section:* 27 to 35 percent clay

*Depth to Bkn horizon:* 12 to 20 inches

*Depth to lithologic discontinuity:* 18 to 30 inches

#### *Ap horizon*

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Clay content: 27 to 35 percent

Electrical conductivity: Less than 2 mmhos/cm

Sodium adsorption ratio: 4 to 13

Reaction: pH 6.6 to 7.8

#### *Btn, Bkn horizons*

Value: 6 or 7 dry; 5 or 6 moist

Chroma: 3 or 4

Clay content: 27 to 40 percent

Electrical conductivity: 1 to 4 mmhos/cm

Sodium adsorption ratio: 13 to 40

Reaction: pH 7.9 to 9.0

#### *2C horizon*

Value: 6 or 7 dry; 5 or 6 moist

Chroma: 2 or 3

Texture: Silt loam, very fine sandy loam, or loamy very fine sand

Clay content: 0 to 10 percent

Electrical conductivity: Less than 2 mmhos/cm

Sodium adsorption ratio: 4 to 30

Reaction: pH 7.4 to 9.0

## 160--Selow silty clay loam, 0 to 2 percent slopes

### Setting

*Landform:* Lake plains

*Slope:* 0 to 2 percent

*Elevation:* 2,700 to 3,100 feet

*Mean annual precipitation:* 10 to 14 inches

*Frost-free period:* 105 to 120 days

### Composition

#### Major Components

Selow and similar soils: 85 percent

#### Minor Components

McCullum and similar soils: 0 to 7 percent

Polson and similar soils: 0 to 6 percent

Selow, gravelly substratum: 0 to 2 percent

### Major Component Description

*Surface layer texture:* Silty clay loam

*Depth class:* Very deep (more than 60 inches)

*Drainage class:* Well drained

*Dominant parent material:* Glaciolacustrine deposits

*Flooding:* None

*Sodium affected:* Sodic within 30 inches

*Available water capacity:* Mainly 9.5 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## 161--Selow silty clay loam, 2 to 4 percent slopes

### Setting

*Landform:* Lake plains

*Slope:* 2 to 4 percent

*Elevation:* 2,700 to 3,100 feet  
*Mean annual precipitation:* 10 to 14 inches  
*Frost-free period:* 105 to 120 days

### Composition

#### Major Components

Selow and similar soils: 85 percent

#### Minor Components

McCullum and similar soils: 0 to 5 percent

Polson and similar soils: 0 to 5 percent

Selow, gravelly substratum: 0 to 5 percent

### Major Component Description

*Surface layer texture:* Silty clay loam

*Depth class:* Very deep (more than 60 inches)

*Drainage class:* Well drained

*Dominant parent material:* Glaciolacustrine deposits

*Flooding:* None

*Sodium affected:* Sodic within 30 inches

*Available water capacity:* Mainly 9.5 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

### Sharrott Series

Sharrott series consists of shallow, well drained soils on mountain slopes. These soils formed in argillite residuum. Slope is 30 to 60 percent. Elevation is 3,000 to 5,000 feet. The average annual precipitation is 18 to 22 inches, average annual air temperature is 42 to 45 degrees F, and the frost-free period is 90 to 100 days.

**Taxonomic Class:** Loamy-skeletal, mixed, frigid Lithic Ustochrepts

### Typical Pedon

Sharrott very gravelly loam in an area of Winkler-Sharrott-Rock outcrop complex, 30 to 60 percent slopes, in woodland; approximately 1,800 feet east and 2,300 feet south of the northwest corner of sec. 17, T. 22 N., R. 22 W.

Oi--1 inch to 0; undecomposed needles and twigs.  
A--0 to 4 inches; light brownish gray (2.5Y 6/2) very gravelly loam, very dark grayish brown (2.5Y 3/2) moist; weak fine granular structure; soft, friable, slightly sticky and slightly plastic; many fine and very fine roots; 40 percent angular pebbles and 5 percent angular cobbles; neutral; clear smooth boundary.

Bw--4 to 11 inches; pale brown (10YR 6/3) very gravelly loam, brown (10YR 4/3); weak medium subangular blocky structure; soft, friable, slightly sticky and slightly plastic; many fine and very fine roots; 50 percent angular pebbles and 5 percent angular cobbles; neutral; abrupt wavy boundary.

BC--11 to 19 inches; white (10YR 8/2) extremely gravelly loam, light brownish gray (10YR 6/2) moist; moderate medium subangular blocky structure; soft, friable, slightly sticky and slightly plastic; common fine and very fine roots; common fine and very fine tubular and interstitial pores; 65 percent angular pebbles and 10 percent angular cobbles; slightly acid.

R--19 inches; argillite bedrock.

### Range in Characteristics

*Soil temperature:* 44 to 47 degrees F

*Moisture control section:* Between 8 and 20 inches

*Control section:* 10 to 15 percent clay and 35 to 80 percent rock fragments

*Depth to bedrock:* 10 to 20 inches

#### A horizon

Hue: 10YR, 2.5Y, or 7.5YR

Value: 4, 5, or 6 dry; 2, 3, or 4 moist

Chroma: 2 or 3

Clay content: 10 to 15 percent

Content of rock fragments: 15 to 50 percent--0 to 25 percent angular cobbles and stones, 15 to 40 percent angular pebbles

Reaction: pH 5.6 to 7.3

Other features: Some pedons have a thin E horizon

#### Bw horizon

Hue: 7.5YR or 10YR

Value: 6 or 7 dry; 4 or 5 moist

Chroma: 2, 3, or 4  
Clay content: 10 to 15 percent  
Content of rock fragments: 35 to 60 percent--0  
to 10 percent angular cobbles, 35 to 50  
percent angular pebbles  
Reaction: pH 5.6 to 7.3

*BC horizon*

Hue: 7.5YR or 10YR  
Value: 6, 7, or 8 dry; 4, 5, or 6 moist  
Chroma: 2 or 3  
Clay content: 10 to 15 percent  
Content of rock fragments: 65 to 80 percent--0  
to 10 percent angular cobbles, 65 to 70  
percent angular pebbles  
Reaction: pH 5.6 to 7.3

## Tevis Series

Tevis series consists of very deep, somewhat excessively drained soils on mountain slopes. These soils formed in colluvium derived from argillite and quartzite. Slope is 30 to 60 percent. Elevation is 3,300 to 5,500 feet. The average annual precipitation is 25 to 40 inches, average annual air temperature is 40 to 45 degrees F, and the frost-free period is 60 to 90 days.

**Taxonomic Class:** Loamy-skeletal, mixed, frigid Dystric Eutrochrepts

### Typical Pedon

Tevis very gravelly loam, 30 to 60 percent slopes, in an area of woodland; approximately 2,600 feet north and 1,100 feet east of the southwest corner of sec. 10, T. 25 N., R. 21 W.

Oi--2 inches to 0; fresh and partially decomposed forest litter; abrupt wavy boundary.

E1--0 to 7 inches; light gray (10YR 7/2) very gravelly loam, grayish brown (10YR 5/2) moist; weak medium granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots and common medium and coarse roots; 45 percent pebbles and 5 percent cobbles; slightly acid; clear wavy boundary.

E2--7 to 14 inches; light gray (10YR 7/1) extremely gravelly loam, gray (10YR 5/1) moist; moderate medium subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots and common medium and coarse roots; common fine and medium pores and few very

fine pores; 60 percent pebbles and 10 percent cobbles; slightly acid; clear wavy boundary.  
E3--14 to 33 inches; light gray (10YR 7/1) extremely gravelly sandy loam, gray (10YR 5/1) moist; moderate medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine, fine, and medium roots and few coarse roots; common fine and medium pores; 55 percent pebbles and 10 percent cobbles; slightly acid; clear wavy boundary.

E/Bw--33 to 60 inches; 80 percent is light gray (10YR 7/1) extremely gravelly sandy loam, gray (10YR 6/1) moist (E part); 20 percent is light brownish gray (10YR 6/2) extremely gravelly sandy loam, grayish brown (10YR 5/2) moist (Bw part); moderate medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; few very fine and fine roots; few fine and medium pores; 60 percent pebbles and 10 percent cobbles; slightly acid.

### Range in Characteristics

*Soil temperature:* 40 to 46 degrees F

*Moisture control section:* Between 8 and 24 inches

*Control section:* 5 to 10 percent clay and 60 to 85 percent rock fragments

*E1 horizon*

Hue: 10YR or 7.5YR

Value: 6 or 7 dry; 4 or 5 moist

Chroma: 2 or 3

Clay content: 10 to 15 percent

Content of rock fragments: 35 to 60 percent--0  
to 10 percent cobbles, 35 to 50 percent  
pebbles

Reaction: pH 5.6 to 7.3

*E2, E3 horizons*

Hue: 10YR or 7.5YR

Value: 6 or 7 dry; 4 or 5 moist

Chroma: 1, 2, or 3

Texture: Fine sandy loam, sandy loam, or loam

Clay content: 5 to 10 percent

Content of rock fragments: 60 to 80 percent--0  
to 10 percent cobbles, 55 to 70 percent  
pebbles

Reaction: pH 5.6 to 7.3

*E/Bw horizon*

Hue: E part--10YR or 7.5YR

Value: E part--6 or 7 dry and 5 or 6 moist; B  
part--5 or 6 dry and 4 or 5 moist

Chroma: E part--1, 2 or 3; B part--2, 3, or 4

Texture: Sandy loam, fine sandy loam, or loam

Clay content: 5 to 10 percent

Content of rock fragments: 60 to 85 percent--0 to 10 percent cobbles, 60 to 75 percent pebbles  
Reaction: pH 6.1 to 7.3

## 162--Tevis very gravelly loam, 30 to 60 percent slopes

### Setting

*Landform:* Mountains  
*Slope:* 30 to 60 percent  
*Elevation:* 3,300 to 5,500 feet  
*Mean annual precipitation:* 25 to 40 inches  
*Frost-free period:* 60 to 90 days

### Composition

#### Major Components

Tevis and similar soils: 85 percent

#### Minor Components

Courville and similar soils: 0 to 5 percent  
Mitten and similar soils: 0 to 5 percent  
Areas of rock outcrop: 0 to 5 percent

### Major Component Description

*Surface layer texture:* Very gravelly loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Somewhat excessively drained  
*Dominant parent material:* Colluvium  
*Native plant cover type:* Forest land  
*Flooding:* None  
*Available water capacity:* Mainly 2.9 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Forest Land" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## Trapps Series

Trapps series consists of very deep, well drained soils on mountain slopes. These soils formed in colluvium derived from limestone. Slope is 8 to 30 percent. Elevation is 3,500 to 4,200 feet. The average annual precipitation is 18 to 25 inches, average annual air temperature is 40 to 45 degrees F, and the frost-free period is 60 to 90 days.

**Taxonomic Class:** Loamy-skeletal, mixed Typic Eutroboralfs

### Typical Pedon

Trapps gravelly loam, 15 to 30 percent slopes, in an area of woodland; approximately 1,900 feet south and 1,100 feet east of the northwest corner of sec. 17, T. 25 N., R. 21 W.

Oi--1 inch to 0; fresh and partially decomposed forest litter; abrupt wavy boundary.

A--0 to 3 inches; dark gray (10YR 4/1) gravelly loam, black (10YR 2/1) moist; weak fine granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots and common medium roots; 15 percent pebbles; neutral; clear smooth boundary.

E--3 to 13 inches; light brownish gray (10YR 6/2) gravelly loam, grayish brown (10YR 5/2) moist; medium coarse granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots and common medium roots; 30 percent pebbles; neutral; clear wavy boundary, or calcareous argillite.

Bt1--13 to 19 inches; pale brown (10YR 6/3) very gravelly clay loam, dark brown (10YR 4/3) moist; moderate medium subangular blocky structure; slightly hard, friable, sticky and plastic; common very fine, fine, and medium roots; few very fine and fine interstitial pores; common distinct clay films on faces of peds; 40 percent pebbles; neutral; clear wavy boundary.

Bt2--19 to 27 inches; pale brown (10YR 6/3) very gravelly clay loam, brown (10YR 4/3) moist; moderate medium subangular blocky structure; slightly hard, friable, sticky and plastic; common very fine, fine, and medium roots; few very fine and fine interstitial pores; common distinct clay films on faces of peds; 35 percent pebbles and 5 percent cobbles; mildly alkaline; abrupt wavy boundary.

Bk--27 to 60 inches; very pale brown (10YR 7/3) very gravelly loam, pale brown (10YR 6/3) moist; massive; soft, very friable, slightly sticky and slightly plastic; common very fine and fine roots and few medium roots; common very fine and fine tubular pores; 35 percent pebbles and 10 percent cobbles; disseminated lime; violently effervescent; moderately alkaline.

### Range in Characteristics

*Soil temperature:* 40 to 47 degrees F  
*Moisture control section:* Between 4 and 12 inches

*Depth to Bk horizon:* 15 to 35 inches

#### *A horizon*

Clay content: 10 to 15 percent  
Content of rock fragments: 15 to 35 percent pebbles  
Reaction: pH 5.6 to 7.3

#### *E horizon*

Value: 6 or 7 dry; 5 or 6 moist  
Chroma: 2, 3, or 4  
Clay content: 10 to 15 percent  
Content of rock fragments: 15 to 35 percent--0 to 20 percent cobbles, flagstones, and stones, 15 to 35 percent pebbles or channers  
Reaction: pH 5.6 to 7.3

#### *Bt horizons*

Hue: 7.5YR, 10YR, or 2.5Y  
Value: 5, 6, or 7 dry; 3, 4, or 5 moist  
Chroma: 2, 3, 4, or 6  
Clay content: 27 to 35 percent  
Content of rock fragments: 35 to 60 percent--0 to 10 percent cobbles or flagstones, 35 to 50 percent pebbles or channers  
Reaction: pH 6.6 to 8.4

#### *Bk horizon*

Hue: 7.5YR, 10YR, or 2.5Y  
Value: 6, 7, or 8 dry; 5 or 6 moist  
Chroma: 2, 3, 4, 6, or 8  
Texture: Loam or sandy loam  
Clay content: 10 to 15 percent  
Content of rock fragments: 35 to 60 percent--0 to 20 percent cobbles, flagstones, or stones, 35 to 40 percent pebbles or channers  
Calcium carbonate equivalent: 15 to 40 percent  
Reaction: pH 7.9 to 8.4

## 163--Trapps gravelly loam, 8 to 15 percent slopes

### Setting

*Landform:* Mountains

*Slope:* 8 to 15 percent

*Elevation:* 3,500 to 4,200 feet

*Mean annual precipitation:* 18 to 25 inches

*Frost-free period:* 70 to 90 days

### Composition

#### Major Components

Trapps and similar soils: 85 percent

#### Minor Components

Eaglewing and similar soils: 0 to 5 percent

Flott and similar soils: 0 to 5 percent

Rumblecreek and similar soils: 0 to 5 percent

### Major Component Description

*Surface layer texture:* Gravelly loam

*Depth class:* Very deep (more than 60 inches)

*Drainage class:* Well drained

*Dominant parent material:* Limestone colluvium

*Native plant cover type:* Forest land

*Flooding:* None

*Available water capacity:* Mainly 6.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Forest Land" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## 164--Trapps gravelly loam, 15 to 30 percent slopes

### Setting

*Landform:* Mountains  
*Slope:* 15 to 30 percent  
*Elevation:* 3,500 to 4,200 feet  
*Mean annual precipitation:* 18 to 25 inches  
*Frost-free period:* 60 to 90 days

### Composition

#### Major Components

Trapps and similar soils: 85 percent

#### Minor Components

Eaglewing and similar soils: 0 to 10 percent

Kingspoint and similar soils: 0 to 5 percent

### Major Component Description

*Surface layer texture:* Gravelly loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Limestone colluvium  
*Native plant cover type:* Forest land  
*Flooding:* None  
*Available water capacity:* Mainly 6.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Forest Land" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

### Truscreek Series

Truscreek series consists of very deep, well drained soils on stream terraces and alluvial fans. These soils formed in glaciofluvial deposits. Slope is 0 to 8 percent. Elevation is 2,800 to 3,300

feet. The average annual precipitation is 15 to 19 inches, average annual air temperature is 42 to 45 degrees F, and the frost-free period is 105 to 130 days.

**Taxonomic Class:** Fine-silty, mixed, frigid Calcic Haploxerolls

### Typical Pedon

Truscreek silt loam, 0 to 2 percent slopes, in an area of cropland; 2,400 feet west and 1,350 feet south of the northeast corner of sec. 32, T. 22 N., R. 20 W.

Ap1--0 to 9 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak coarse subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; many fine roots; common fine and very fine tubular pores; neutral; abrupt smooth boundary.

Ap2--9 to 12 inches; pale brown (10YR 6/3) silt loam, dark grayish brown (10YR 4/2) moist; weak coarse subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; many fine roots; common fine pores; neutral; clear smooth boundary.

Bw--12 to 25 inches; very pale brown (10YR 7/3) silt loam, brown (10YR 5/3) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many fine and medium roots; few very fine and fine pores; mildly alkaline; clear wavy boundary.

Bk--25 to 32 inches; white (10YR 8/2) silt loam, pale brown (10YR 6/3) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common fine and medium roots; few very fine and fine pores; common fine threads of lime; violently effervescent; moderately alkaline; clear smooth boundary.

C1--32 to 42 inches; white (10YR 8/2) silt loam, pale brown (10YR 6/3) moist; massive; fine stratification; slightly hard, friable, slightly sticky and slightly plastic; few fine roots; few very fine pores; disseminated lime; violently effervescent; moderately alkaline; clear smooth boundary.

C2--42 to 60 inches; white (10YR 8/2) silt loam, pale brown (10YR 6/3) moist; massive; fine stratification, few 1/4- to 1/2-inch thick varves; slightly hard, friable, slightly sticky and slightly plastic; disseminated lime; strongly effervescent; moderately alkaline.

## Range in Characteristics

*Soil temperature:* 44 to 47 degrees F  
*Moisture control section:* Between 4 and 12 inches  
*Mollic epipedon thickness:* 8 to 14 inches  
*Content of clay in the control section:* 18 to 27 percent  
*Depth to Bk horizon:* 19 to 30 inches

### *Ap1 horizon*

Value: 4 or 5 dry; 2 or 3 moist  
Chroma: 2 or 3  
Clay content: 18 to 27 percent  
Reaction: pH 6.1 to 7.3

### *Ap2 horizon*

Value: 5 or 6 dry; 3 or 4 moist  
Chroma: 2 or 3  
Clay content: 18 to 27 percent  
Reaction: pH 6.6 to 7.3

### *Bw horizon*

Value: 6 or 7 dry; 5 or 6 moist  
Chroma: 3 or 4  
Clay content: 18 to 27 percent  
Reaction: pH 7.4 to 7.8

### *Bk horizon*

Value: 7 or 8 dry; 5 or 6 moist  
Chroma: 2 or 3  
Clay content: 18 to 27 percent  
Calcium carbonate equivalent: 15 to 20 percent  
Reaction: pH 7.9 to 8.4

### *C horizons*

Value: 7 or 8 dry; 5 or 6 moist  
Chroma: 2 or 3  
Clay content: 12 to 27 percent  
Calcium carbonate equivalent: 5 to 15 percent  
Reaction: pH 7.9 to 8.4

## 165--Truscreek silt loam, 0 to 2 percent slopes

### Setting

*Landform:* Alluvial fans and stream terraces  
*Slope:* 0 to 2 percent  
*Elevation:* 2,800 to 3,300 feet  
*Mean annual precipitation:* 15 to 19 inches  
*Frost-free period:* 105 to 130 days

### Composition

#### Major Components

Truscreek and similar soils: 85 percent

#### Minor Components

Polson and similar soils: 0 to 5 percent  
Belton and similar soils: 0 to 5 percent  
Gird and similar soils: 0 to 5 percent

### Major Component Description

*Surface layer texture:* Silt loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Glaciofluvial deposits  
*Flooding:* None  
*Available water capacity:* Mainly 10.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## 166--Truscreek-Polson silt loams, 0 to 2 percent slopes

### Setting

*Landform:*  
\* Truscreek--Alluvial fans and stream terraces  
\* Polson--Alluvial fans and stream terraces  
*Slope:*  
\* Truscreek--0 to 2 percent  
\* Polson--0 to 2 percent  
*Elevation:* 2,800 to 3,300 feet  
*Mean annual precipitation:* 15 to 19 inches  
*Frost-free period:* 105 to 130 days

### Composition

#### Major Components

Truscreek and similar soils: 60 percent  
Polson and similar soils: 30 percent

#### Minor Components

Belton and similar soils: 0 to 5 percent  
Gird and similar soils: 0 to 5 percent

## Major Component Description

### Truscreek

*Surface layer texture:* Silt loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Glaciofluvial deposits  
*Flooding:* None  
*Available water capacity:* Mainly 10.8 inches

### Polson

*Surface layer texture:* Silt loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Lacustrine deposits  
*Flooding:* None  
*Sodium affected:* Sodic within 30 inches  
*Available water capacity:* Mainly 8.3 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

## Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## 167--Truscreek-Polson silt loams, 2 to 4 percent slopes

### Setting

#### *Landform:*

- \* Truscreek--Alluvial fans and stream terraces
- \* Polson--Alluvial fans and stream terraces

#### *Slope:*

- \* Truscreek--2 to 4 percent
- \* Polson--2 to 4 percent

*Elevation:* 2,800 to 3,300 feet

*Mean annual precipitation:* 15 to 19 inches

*Frost-free period:* 105 to 130 days

## Composition

### Major Components

Truscreek and similar soils: 60 percent  
Polson and similar soils: 25 percent

### Minor Components

Belton and similar soils: 0 to 10 percent  
Gird and similar soils: 0 to 5 percent

## Major Component Description

### Truscreek

*Surface layer texture:* Silt loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Glaciofluvial deposits  
*Flooding:* None  
*Available water capacity:* Mainly 10.8 inches

### Polson

*Surface layer texture:* Silt loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Lacustrine deposits  
*Flooding:* None  
*Sodium affected:* Sodic within 30 inches  
*Available water capacity:* Mainly 8.3 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

## Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## 168--Truscreek-Polson silt loams, 4 to 8 percent slopes

### Setting

#### *Landform:*

- \* Truscreek--Alluvial fans and stream terraces

\* Polson--Alluvial fans and stream terraces

*Slope:*

\* Truscreek--4 to 8 percent

\* Polson--4 to 8 percent

*Elevation:* 2,800 to 3,300 feet

*Mean annual precipitation:* 15 to 19 inches

*Frost-free period:* 105 to 130 days

## Composition

### Major Components

Truscreek and similar soils: 60 percent

Polson and similar soils: 25 percent

### Minor Components

Belton and similar soils: 0 to 5 percent

Gird and similar soils: 0 to 5 percent

Ninepipe and similar soils: 0 to 5 percent

## Major Component Description

### Truscreek

*Surface layer texture:* Silt loam

*Depth class:* Very deep (more than 60 inches)

*Drainage class:* Well drained

*Dominant parent material:* Glaciofluvial deposits

*Flooding:* None

*Available water capacity:* Mainly 10.8 inches

### Polson

*Surface layer texture:* Silt loam

*Depth class:* Very deep (more than 60 inches)

*Drainage class:* Well drained

*Dominant parent material:* Lacustrine deposits

*Flooding:* None

*Sodium affected:* Sodic within 30 inches

*Available water capacity:* Mainly 8.3 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

## Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## Typic Haplaquepts

Typic Haplaquepts consist of very deep, very poorly drained soils on flood plains. These soils formed in alluvium. Slope is 0 to 2 percent. Elevation is 2,700 to 3,000 feet. The average annual precipitation is 12 to 19 inches, average annual air temperature is 42 to 47 degrees F, and the frost-free period is 105 to 120 days.

## Typical Pedon

Typic Haplaquepts, 0 to 2 percent slopes, in an area of pasture; 120 feet north and 100 feet east of the southwest corner of sec. 6, T. 21 N., R. 19 W.

A--0 to 5 inches; dark grayish brown (10YR 4/2) silt loam, very dark brown (10YR 2/2) moist; moderate fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine and fine roots; many very fine and fine tubular pores; slightly acid; clear irregular boundary.

Bg15 to 15 inches; light gray (10YR 7/1) silt loam, dark grayish brown (10YR 4/2) moist, with common medium distinct yellowish brown (10YR 5/4) mottles; moderate medium and fine granular structure; soft, very friable, nonsticky and nonplastic; common very fine and fine roots; common very fine and fine tubular pores; slightly acid; gradual irregular boundary.

Bg2--15 to 37 inches; white (10YR 8/1) silt loam, gray (10YR 6/1) moist, common medium distinct brownish yellow (10YR 6/6) mottles; massive; soft, very friable, nonsticky and nonplastic; few very fine and fine roots; common very fine and fine pores; neutral; gradual boundary.

2Cg--37 to 60 inches; white (10YR 8/1) gravelly sandy loam, gray (10YR 6/1) moist, common medium distinct brownish yellow (10YR 6/6) mottles; massive; soft, very friable, nonsticky and nonplastic; few fine roots; few fine pores; 15 percent pebbles; neutral.

## Range in Characteristics

*Depth to water table:* 0 to 18 inches

*Texture:* Gravelly sandy loam to silty clay loam

## 169--Typic Haplaquepts, 0 to 2 percent slopes

### Setting

*Landform:* Flood plains

*Slope:* 0 to 2 percent

*Elevation:* 2,700 to 3,000 feet

*Mean annual precipitation:* 12 to 19 inches

*Frost-free period:* 105 to 120 days

### Composition

#### Major Components

Typic Haplaquepts and similar soils: 85 percent

#### Minor Components

Bolack and similar soils: 0 to 5 percent

Bohnly and similar soils: 0 to 5 percent

Whitearth and similar soils: 0 to 5 percent

### Major Component Description

*Depth class:* Very deep (more than 60 inches)

*Drainage class:* Very poorly drained

*Dominant parent material:* Alluvium

*Ponding:* Long

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

### Vincom Series

Vincom series consist of very deep, well drained soils on dissected lake plains, stream terraces, alluvial fans, and relict stream terraces. These soils formed in silty glaciolacustrine and lacustrine deposits. Slope is 4 to 60 percent. Elevation is 2,600 to 3,300 feet. The average annual precipitation is 12 to 17 inches, average annual

air temperature is 41 to 45 degrees F, and the frost-free period is 105 to 120 days.

**Taxonomic Class:** Fine-silty, mixed (calcareous), frigid Typic Xerorthents

### Typical Pedon

Vincom silt loam in an area of Vincom-Lonepine silt loams, 8 to 15 percent slopes, in rangeland; 1,320 feet north and 2,640 feet west of the southeast corner of sec. 30, T. 22 N., R. 21 W.

- A--0 to 5 inches; light brownish gray (10YR 6/2) silt loam, dark grayish brown (10YR 4/2) moist; moderate thin platy structure; soft, very friable, slightly sticky and slightly plastic; common very fine roots; few very fine interstitial pores; moderately alkaline; clear wavy boundary.
- Bk--5 to 22 inches; light gray (10YR 7/2) silty clay loam, brown (10YR 5/3) moist; moderate medium and fine subangular blocky structure; hard, friable, sticky and plastic; few very fine roots; common very fine interstitial pores; few fine masses of lime; strongly effervescent; very strongly alkaline; gradual irregular boundary.
- C--22 to 60 inches; white (10YR 8/2) silt loam and silty clay loam, pale brown (10YR 6/3) moist; 1/4- to 1/2-inch varves; strong medium platy structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; strongly effervescent; strongly alkaline.

### Range in Characteristics

*Soil temperature:* 43 to 47 degrees F

*Moisture control section:* Between 4 and 12 inches

*Content of clay in the control section:* 18 to 35 percent

*Depth to varves:* 6 to 22 inches

#### A horizon

Value: 6 or 7 dry; 4 or 5 moist

Clay content: 15 to 27 percent

Electrical conductivity: 0 to 2 mmhos/cm

Sodium adsorption ratio: 0 to 13

Reaction: pH 7.9 to 8.4

#### Bk horizon

Value: 7 or 8 dry; 5 or 6 moist

Texture: Silt loam or silty clay loam

Clay content: 18 to 35 percent

Calcium carbonate equivalent: 2 to 8 percent

Electrical conductivity: 0 to 2 mmhos/cm

Sodium adsorption ratio: 0 to 20

Reaction: pH 8.4 to 9.6

### *C horizon*

Value: 7 or 8 dry; 6 or 7 moist  
Chroma: 2 or 3  
Texture: Silt loam or silty clay loam consisting of varves that are silty clay and very fine sandy loam  
Clay content: 18 to 35 percent  
Electrical conductivity: 0 to 2 mmhos/cm  
Sodium adsorption ratio: 0 to 20  
Reaction: pH 8.4 to 9.6

## **170--Vincom silt loam, 15 to 60 percent slopes**

### **Setting**

*Landform:* Lake plains  
*Slope:* 15 to 60 percent  
*Elevation:* 2,600 to 3,200 feet  
*Mean annual precipitation:* 12 to 14 inches  
*Frost-free period:* 105 to 120 days

### **Composition**

#### **Major Components**

Vincom and similar soils: 85 percent

#### **Minor Components**

Lonepine and similar soils: 0 to 3 percent  
Irvine and similar soils: 0 to 2 percent  
Polson and similar soils: 0 to 3 percent  
Truscreek and similar soils: 0 to 3 percent  
Areas of badland: 0 to 2 percent  
Vincom very gravelly loam: 0 to 2 percent

### **Major Component Description**

*Surface layer texture:* Silt loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Lacustrine deposits  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Sodium affected:* Sodic within 30 inches  
*Available water capacity:* Mainly 9.0 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

## **Management**

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## **171--Vincom-Lonepine silt loams, 8 to 15 percent slopes**

### **Setting**

*Landform:*  
\* Vincom--Lake plains  
\* Lonepine--Lake plains  
*Position on landform:*  
\* Vincom--Back slopes and shoulders  
\* Lonepine--Foot slopes and toe slopes  
*Slope:*  
\* Vincom--8 to 15 percent  
\* Lonepine--8 to 15 percent  
*Elevation:* 2,600 to 3,200 feet  
*Mean annual precipitation:* 12 to 14 inches  
*Frost-free period:* 105 to 120 days

### **Composition**

#### **Major Components**

Vincom and similar soils: 60 percent  
Lonepine and similar soils: 30 percent

#### **Minor Components**

Irvine and similar soils: 0 to 2 percent  
Gird and similar soils: 0 to 2 percent  
Truscreek and similar soils: 0 to 2 percent  
Ninepipe and similar soils: 0 to 2 percent  
Vincom gravelly loam: 0 to 2 percent

### **Major Component Description**

#### **Vincom**

*Surface layer texture:* Silt loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Lacustrine deposits  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Sodium affected:* Sodic within 30 inches  
*Available water capacity:* Mainly 9.0 inches

## Lonepine

*Surface layer texture:* Silt loam

*Depth class:* Very deep (more than 60 inches)

*Drainage class:* Well drained

*Dominant parent material:* Lacustrine deposits

*Native plant cover type:* Rangeland

*Flooding:* None

*Available water capacity:* Mainly 10.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

## Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## Waldbillig Series

Waldbillig series consists of very deep, well drained soils on mountain slopes. These soils formed in colluvium derived from glacial drift. These soils have a surface layer of volcanic ash-influenced loess. Slope is 15 to 60 percent. Elevation is 4,000 to 6,000 feet. The average annual precipitation is 30 to 50 inches, average annual air temperature is 37 to 42 degrees F, and the frost-free period 30 to 60 days.

**Taxonomic Class:** Loamy-skeletal, mixed Andic Cryochrepts

## Typical Pedon

Waldbillig gravelly silt loam, 15 to 30 percent slopes, in an area of woodland; approximately 800 feet east and 400 feet north of the southwest corner of sec. 17, T. 17 N., R. 18 W.

Oi--2 inches to 0; undecomposed and slightly decomposed forest litter.

Bs--0 to 9 inches; yellowish brown (10YR 5/4) gravelly silt loam, dark yellowish brown (10YR 4/4) moist; weak fine granular structure; soft,

very friable, nonsticky and nonplastic; many fine and medium roots; 25 percent pebbles; slightly acid; abrupt smooth boundary.  
2E--9 to 25 inches; pinkish gray (5YR 7/2) very gravelly sandy loam, reddish brown (5YR 5/3) moist; weak medium subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; many fine and medium roots and common coarse roots; many fine and very fine tubular pores; 50 percent pebbles and 5 percent cobbles; medium acid; clear wavy boundary.  
2E and Bt--25 to 60 inches; 75 percent is light reddish brown (5YR 6/3) very gravelly sandy loam, reddish brown (5YR 5/4) moist (E part), 25 percent is reddish brown (5YR 5/4) very fine sandy loam lamellae 1/4 to 1/2 inch thick, dark reddish brown (5YR 3/4) moist (B part); weak medium subangular blocky structure; very hard, very friable, nonsticky and nonplastic; common medium and few fine roots; common fine and very fine tubular pores; 40 percent pebbles and 10 percent cobbles; slightly acid.

## Range in Characteristics

*Soil temperature:* 39 to 44 degrees F

*Moisture control section:* Between 8 and 24 inches

*Control section:* 7 to 18 percent clay and more than 15 percent fine sand or coarser

### Bs horizon

Hue: 7.5YR, 10YR

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 3 or 4

Clay content: 5 to 15 percent

Content of rock fragments: 15 to 35 percent--0 to 10 percent cobbles, stones, and boulders, 15 to 25 percent pebbles

Moist bulk density: 0.95 g/cc or less

Reaction: pH 5.6 to 6.5

### 2E horizon

Hue: 5YR, 7.5YR

Value: 6 or 7 dry; 5 or 6 moist

Chroma: 2 or 3

Texture: Fine sandy loam or sandy loam

Clay content: 7 to 18 percent

Content of rock fragments: 35 to 60 percent--5 to 10 percent cobbles, stones, and boulders, 30 to 50 percent pebbles

Reaction: pH 5.6 to 6.5

### 2E and Bt horizon

Hue: E part--5YR or 7.5YR; B part--5YR or 7.5YR

Value: E part--5, 6, or 7 dry and 4, 5, or 6 moist; B part--5 or 6 dry and 3 or 4 moist  
Chroma: E part--3 or 4; B part--2, 3, or 4  
Texture: Fine sandy loam, sandy loam, or loam  
Clay content: 7 to 18 percent, lamellae has less than 3 percent clay increase  
Content of rock fragments: 35 to 60 percent--5 to 20 percent cobbles, stones, and boulders, 30 to 40 percent pebbles  
Reaction: pH 6.1 to 7.3

## **172--Waldbillig gravelly silt loam, 15 to 30 percent slopes**

### **Setting**

*Landform:* Mountains  
*Slope:* 15 to 30 percent  
*Elevation:* 4,000 to 6,000 feet  
*Mean annual precipitation:* 30 to 50 inches  
*Frost-free period:* 30 to 60 days

### **Composition**

#### **Major Components**

Waldbillig and similar soils: 85 percent

#### **Minor Components**

Holloway and similar soils: 0 to 5 percent  
Areas of rock outcrop: 0 to 5 percent  
Waldbillig shallow to rock: 0 to 5 percent

### **Major Component Description**

*Surface layer texture:* Gravelly silt loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Colluvium  
*Native plant cover type:* Forest land  
*Flooding:* None  
*Available water capacity:* Mainly 5.9 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### **Management**

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

\* "Range" section

- \* "Forest Land" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## **173--Waldbillig gravelly silt loam, 30 to 60 percent slopes**

### **Setting**

*Landform:* Mountains  
*Slope:* 30 to 60 percent  
*Elevation:* 4,000 to 6,000 feet  
*Mean annual precipitation:* 30 to 50 inches  
*Frost-free period:* 30 to 60 days

### **Composition**

#### **Major Components**

Waldbillig and similar soils: 85 percent

#### **Minor Components**

Holloway and similar soils: 0 to 5 percent  
Areas of rock outcrop: 0 to 5 percent  
Waldbillig shallow to rock: 0 to 5 percent

### **Major Component Description**

*Surface layer texture:* Gravelly silt loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Colluvium  
*Native plant cover type:* Forest land  
*Flooding:* None  
*Available water capacity:* Mainly 5.9 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### **Management**

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Forest Land" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## Walstead Series

Walstead series consists of very deep, well drained soils on moraines, hills, and alluvial fans. These soils formed in calcareous loamy till and alluvium. Slope is 0 to 45 percent. Elevation is 2,900 to 3,900 feet. The average annual precipitation is 18 to 22 inches, average annual air temperature is 40 to 45 degrees F, and the frost-free period is 90 to 110 days.

**Taxonomic Class:** Loamy-skeletal, mixed Udic Haploborolls

### Typical Pedon

Walstead gravelly loam, 4 to 15 percent slopes, in an area of pasture; 1,280 feet north and 175 feet west of the southeast corner of sec. 4, T. 18 N., R. 19 W.

A1--0 to 8 inches; dark gray (10YR 4/1) gravelly loam, black (10YR 2/1) moist; moderate medium granular structure; soft, very friable, slightly sticky and slightly plastic; many fine and very fine roots; many fine and very fine pores; 20 percent pebbles and 5 percent cobbles; neutral; clear wavy boundary.

AB--8 to 15 inches; brown (10YR 5/3) very gravelly loam, very dark grayish brown (10YR 3/2) moist; moderate medium subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots; many fine and very fine pores; 30 percent pebbles and 5 percent cobbles; neutral; clear wavy boundary.

Bw1--15 to 22 inches; yellowish brown (10YR 5/4) very gravelly loam, brown (10YR 4/3) moist; weak medium and coarse subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; common fine roots; common fine pores; 35 percent pebbles and 5 percent cobbles; neutral; gradual wavy boundary.

Bw2--22 to 36 inches; pale brown (10YR 6/3) very gravelly loam, brown (10YR 4/3) moist; weak medium and coarse subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common fine roots; common fine pores; 50 percent pebbles and 10 percent cobbles; neutral; gradual smooth boundary.

Bk1--36 to 44 inches; very pale brown (10YR 7/3) very gravelly loam, grayish brown (2.5Y 5/2) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few fine roots; 50

percent pebbles and 10 percent cobbles; disseminated lime; violently effervescent; moderately alkaline; gradual wavy boundary. Bk2--44 to 60 inches; white (10YR 8/2) very gravelly loam, pale brown (10YR 6/3) moist; massive; soft, very friable, slightly sticky and slightly plastic; few fine roots; 40 percent pebbles and 10 percent cobbles; disseminated lime; strongly effervescent; moderately alkaline.

### Range in Characteristics

*Soil temperature:* 42 to 47 degrees F

*Moisture control section:* Between 4 and 12 inches

*Mollic epipedon thickness:* 10 to 16 inches

*Control section:* 10 to 25 percent clay, 35 to 60 percent rock fragments

*Depth to Bk horizon:* 23 to 39 inches

*Soil phases:* Stony and very stony

#### A horizon

Value: 3, 4, or 5 dry; 2 or 3 moist

Chroma: 1 or 2

Clay content: 15 to 25 percent

Content of rock fragments: 15 to 60 percent--0 to 15 percent stones and cobbles, 15 to 45 percent pebbles; stony phase--5 to 20 percent stones and cobbles, 10 to 15 percent pebbles; very stony phase--10 to 25 percent stones and cobbles, 10 to 15 percent pebbles

Reaction: pH 6.6 to 7.3

#### AB horizon

Value: 4 or 5 dry; 2 or 3 moist

Chroma: 2 or 3

Clay content: 15 to 25 percent

Content of rock fragments: 25 to 45 percent--5 to 15 percent stones and cobbles, 20 to 30 percent pebbles

Reaction: pH 6.6 to 7.3

#### Bw1 horizon

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2, 3, or 4

Clay content: 15 to 25 percent

Texture: Loam or sandy loam

Content of rock fragments: 35 to 60 percent--5 to 25 percent stones and cobbles, 30 to 35 percent pebbles

Reaction: pH 6.6 to 7.3

#### Bw2 horizon

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 3 or 4

Texture: Loam or sandy loam

Clay content: 10 to 25 percent

Content of rock fragments: 35 to 60 percent--5 to 25 percent stones and cobbles, 30 to 50 percent pebbles

Reaction: pH 6.6 to 7.8

**Bk1 horizon**

Hue: 10YR or 2.5Y

Value: 7 or 8 dry; 5 or 6 moist

Chroma: 2 or 3

Texture: Loam or sandy loam

Clay content: 10 to 25 percent

Content of rock fragments: 35 to 60 percent--5 to 25 percent stones and cobbles, 30 to 50 percent pebbles

Calcium carbonate equivalent: 15 to 30 percent

Reaction: pH 7.9 to 8.4

**Bk2 horizon**

Hue: 10YR or 2.5Y

Value: 7 or 8 dry; 5 or 6 moist

Chroma: 2 or 3

Texture: Loam or sandy loam

Clay content: 10 to 25 percent

Content of rock fragments: 35 to 60 percent--5 to 20 percent stones and cobbles, 30 to 40 percent pebbles

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.4 to 8.4

**174--Walstead gravelly loam, 0 to 2 percent slopes**

**Setting**

*Landform:* Alluvial fans

*Slope:* 0 to 2 percent

*Elevation:* 2,900 to 3,600 feet

*Mean annual precipitation:* 18 to 22 inches

*Frost-free period:* 90 to 105 days

**Composition**

**Major Components**

Walstead and similar soils: 90 percent

**Minor Components**

McDonald and similar soils: 0 to 4 percent

Flott and similar soils: 0 to 3 percent

Finleypoint and similar soils: 0 to 3 percent

**Major Component Description**

*Surface layer texture:* Gravelly loam

*Depth class:* Very deep (more than 60 inches)

*Drainage class:* Well drained

*Dominant parent material:* Alluvium

*Flooding:* None

*Available water capacity:* Mainly 6.0 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

**Management**

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

**175--Walstead gravelly loam, 2 to 4 percent slopes**

**Setting**

*Landform:* Alluvial fans

*Slope:* 2 to 4 percent

*Elevation:* 2,900 to 3,600 feet

*Mean annual precipitation:* 18 to 22 inches

*Frost-free period:* 90 to 105 days

**Composition**

**Major Components**

Walstead and similar soils: 85 percent

**Minor Components**

McDonald and similar soils: 0 to 4 percent

Flott and similar soils: 0 to 3 percent

Finleypoint and similar soils: 0 to 3 percent

**Major Component Description**

*Surface layer texture:* Gravelly loam

*Depth class:* Very deep (more than 60 inches)

*Drainage class:* Well drained

*Dominant parent material:* Alluvium

*Flooding:* None

*Available water capacity:* Mainly 6.0 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

## Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

### 176--Walstead gravelly loam, 4 to 15 percent slopes

#### Setting

*Landform:* Moraines

*Slope:* 4 to 15 percent

*Elevation:* 2,900 to 3,900 feet

*Mean annual precipitation:* 18 to 22 inches

*Frost-free period:* 90 to 105 days

#### Composition

##### Major Components

Walstead and similar soils: 85 percent

##### Minor Components

McDonald and similar soils: 0 to 4 percent

Flott and similar soils: 0 to 3 percent

Finleypoint and similar soils: 0 to 3 percent

#### Major Component Description

*Surface layer texture:* Gravelly loam

*Depth class:* Very deep (more than 60 inches)

*Drainage class:* Well drained

*Dominant parent material:* Till

*Flooding:* None

*Available water capacity:* Mainly 5.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

#### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

### 177--Walstead-Rock outcrop complex, 15 to 30 percent slopes

#### Setting

*Landform:*

\* Walstead--Moraines

\* Rock outcrop--Moraines

*Position on landform:*

\* Walstead--Back slopes and foot slopes

\* Rock outcrop--Shoulders and summits

*Slope:*

\* Walstead--15 to 30 percent

\* Rock outcrop--15 to 30 percent

*Elevation:* 2,900 to 3,900 feet

*Mean annual precipitation:* 18 to 22 inches

*Frost-free period:* 90 to 105 days

#### Composition

##### Major Components

Walstead and similar soils: 75 percent

Rock outcrop: 10 percent

##### Minor Components

Flott and similar soils: 0 to 4 percent

Niarada and similar soils: 0 to 3 percent

Hogsby and similar soils: 0 to 3 percent

Walstead very stony loam: 0 to 5 percent

#### Major Component Description

##### Walstead

*Surface layer texture:* Stony loam

*Depth class:* Very deep (more than 60 inches)

*Drainage class:* Well drained

*Dominant parent material:* Till

*Native plant cover type:* Rangeland

*Flooding:* None

*Available water capacity:* Mainly 5.4 inches

##### Rock outcrop

*Definition:* Exposures of bare bedrock

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

## Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## W--Water

### Composition

#### Major Components

Water: 100 percent

#### Major Component Description

*Definition:* Areas of open water

## Whitearth Series

Whitearth series consists of very deep, well drained, sodium-affected soils on alluvial fans and stream terraces. These soils formed in silty alluvium derived from lacustrine deposits. Slopes is 2 to 8 percent. Elevation is 2,700 to 3,000 feet. The average annual precipitation is 10 to 14 inches, average annual air temperature is 41 to 45 degrees F, and the frost-free period is 105 to 120 days.

**Taxonomic Class:** Fine-silty, mixed, frigid Typic Natrixeralfs

### Typical Pedon

Whitearth silt loam, in an area of Whitearth-Esteslake complex, 2 to 8 percent slopes, in rangeland; 2,550 feet east and 1,400 feet north of the southwest corner of sec. 17, T. 22 N., R. 21 W.

Ap--0 to 5 inches; light brownish gray (10YR 6/2) silt loam, dark grayish brown (10YR 4/2) moist; moderate medium subangular blocky structure parting to moderate medium granular; slightly hard, very friable, slightly sticky and slightly plastic; common very fine roots; common very fine tubular pores; moderately alkaline; abrupt smooth boundary.

Btn--5 to 9 inches; pale brown (10YR 6/3) silty clay loam, brown (10YR 4/3) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; hard, firm, slightly sticky and plastic; common very fine roots; common very fine tubular pores; common faint brown (10YR 5/3) clay films on ped faces and in pores; strongly alkaline; clear wavy boundary.

Bkn--9 to 32 inches; very pale brown (10YR 7/3) silty clay loam, pale brown (10YR 6/3) moist; weak medium prismatic structure parting to moderate coarse subangular blocky; hard, firm, sticky and plastic; few very fine roots; few very fine tubular pores; few fine masses of lime; strongly effervescent; very strongly alkaline; clear wavy boundary.

C1--32 to 49 inches; white (10YR 8/2) silt loam, pale brown (10YR 6/3) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few very fine tubular pores; strongly effervescent; strongly alkaline; clear wavy boundary.

C2--49 to 60 inches; very pale brown (10YR 7/3) silt loam, brown (10YR 5/3) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; strongly effervescent; strongly alkaline.

### Range in Characteristics

*Soil temperature:* 43 to 47 degrees F

*Moisture control section:* Between 4 and 12 inches

*Control section:* 27 to 35 percent clay and less than 15 percent fine sand or coarser

#### Ap horizon

Value: 6 or 7 dry; 4 or 5 moist

Clay content: 18 to 27 percent

Electrical conductivity: 0 to 4 mmhos/cm

Sodium adsorption ratio: 5 to 40

Reaction: pH 7.9 to 8.4

#### Btn horizon

Value: 6 or 7 dry; 4 or 5 moist

Clay content: 27 to 35 percent and less than 15 percent fine sand or coarser

Electrical conductivity: 4 to 8 mmhos/cm

Sodium adsorption ratio: 40 to 60

Reaction: pH 8.4 to 9.6

#### Bkn horizon

Value: 7 or 8 dry; 5 or 6 moist

Chroma: 3 or 4

Clay content: 27 to 35 percent and less than 15 percent fine sand or coarser

Calcium carbonate equivalent: 10 to 15 percent

Electrical conductivity: 4 to 8 mmhos/cm  
Sodium adsorption ratio: 20 to 60  
Reaction: pH 8.4 to 9.6

*C1 horizon*

Value: 7 or 8 dry; 5 or 6 moist  
Chroma: 2 or 3  
Clay content: 10 to 27 percent  
Calcium carbonate equivalent: 5 to 10 percent  
Electrical conductivity: 4 to 8 mmhos/cm  
Sodium adsorption ratio: 20 to 60  
Reaction: pH 8.4 to 9.6

*C2 horizon*

Value: 7 or 8 dry; 5 or 6 moist  
Clay content: 10 to 27 percent  
Calcium carbonate equivalent: 5 to 10 percent  
Electrical conductivity: 4 to 16 mmhos/cm  
Sodium adsorption ratio: 60 to 75  
Reaction: pH 8.4 to 9.6

## 178--Whitearth-Esteslake complex, 2 to 8 percent slopes

### Setting

*Landform:*

- \* Whitearth--Alluvial fans and stream terraces
- \* Esteslake--Alluvial fans and stream terraces

*Slope:*

- \* Whitearth--2 to 8 percent
- \* Esteslake--2 to 4 percent

*Elevation:* 2,700 to 3,000 feet

*Mean annual precipitation:* 10 to 14 inches

*Frost-free period:* 105 to 120 days

### Composition

#### Major Components

Whitearth and similar soils: 60 percent  
Esteslake and similar soils: 25 percent

#### Minor Components

Areas of slickspots: 0 to 5 percent  
Lonepine and similar soils: 0 to 5 percent  
Vincom and similar soils: 0 to 5 percent

### Major Component Description

#### Whitearth

*Surface layer texture:* Silt loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Alluvium  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Sodium affected:* Sodic within 30 inches  
*Available water capacity:* Mainly 6.6 inches

#### Esteslake

*Surface layer texture:* Silty clay loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Glaciolacustrine deposits  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Salt affected:* Saline within 30 inches  
*Sodium affected:* Sodic within 30 inches  
*Available water capacity:* Mainly 4.4 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

### Wildgen Series

Wildgen series consists of very deep, well drained soils on mountain slopes and moraines. These soils formed in alpine till. Slope is 8 to 60 percent. Elevation is 3,000 to 5,000 feet. The average annual precipitation is 18 to 24 inches, average annual air temperature is 40 to 45 degrees F, and the frost-free period is 90 to 105 days.

**Taxonomic Class:** Loamy-skeletal, mixed, frigid Typic Ustochrepts

### Typical Pedon

Wildgen gravelly loam in an area of Finleypoint-Wildgen gravelly loams, 30 to 60 percent slopes, in woodland; approximately 1,900 feet west and 1,500 feet south of the northeast corner of sec. 2, T. 23 N., R. 21 W.

Oi--1 inch to 0; partially decomposed needles and twigs.

- A--0 to 6 inches; grayish brown (10YR 5/2) gravelly loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable, slightly sticky and slightly plastic; many fine and very fine roots; 20 percent pebbles; neutral; clear smooth boundary.
- E1--6 to 17 inches; pale brown (10YR 6/3) very gravelly loam, brown (10YR 4/3) moist; moderate medium subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; many fine and very fine roots; few fine tubular pores; 35 percent pebbles; slightly acid; clear wavy boundary.
- E2--17 to 31 inches; light gray (10YR 7/1) very gravelly sandy loam, grayish brown (10YR 5/2) moist; weak coarse and medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; common fine and medium roots; many fine and medium tubular pores; 20 percent cobbles and 35 percent pebbles; slightly acid; gradual wavy boundary.
- E and Bt--31 to 60 inches; 75 percent is light gray (10YR 7/1) very gravelly sandy loam, grayish brown (10YR 5/2) moist (E part); 25 percent is yellowish brown (10YR 5/4) very gravelly sandy loam lamellae, dark yellowish brown (10YR 4/4) moist (Bt part); massive; slightly hard, very friable, slightly sticky and slightly plastic; few fine and medium roots; many fine and medium tubular pores; 10 percent cobbles and 40 percent pebbles; slightly acid.

### Range in Characteristics

- Soil temperature:* 40 to 47 degrees F  
*Moisture control section:* Between 4 and 12 inches  
*Other features:* The dark-colored surface of this soil does not meet the thickness requirement for a mollic epipedon; some pedons have a BC horizon.

#### A horizon

- Hue: 10YR or 7.5YR  
 Value: 5, 6, or 7 dry; 3, 4, or 5 moist  
 Chroma: 1, 2, 3, or 4  
 Clay content: 15 to 25 percent  
 Content of rock fragments: 20 to 50 percent--0 to 15 percent cobbles and stones, 20 to 35 percent pebbles  
 Reaction: pH 6.1 to 7.3

#### E1 horizon

- Hue: 10YR or 7.5YR  
 Value: 6 or 7 dry, 3 or 4 moist  
 Chroma: 2, 3, or 4

- Clay content: 15 to 25 percent  
 Content of rock fragments: 20 to 50 percent--0 to 15 percent cobbles and stones, 20 to 35 percent pebbles  
 Reaction: pH 6.1 to 7.3

#### E2 horizon

- Hue: 10YR or 7.5YR  
 Value: 6, 7, or 8 dry; 4, 5, 6, or 7 moist  
 Chroma: 1, 2, 3, or 4  
 Texture: Loam or sandy loam  
 Clay content: 10 to 25 percent  
 Content of rock fragments: 35 to 60 percent--0 to 20 percent cobbles and stones, 30 to 40 percent pebbles  
 Reaction: pH 6.1 to 7.3

#### E and Bt horizon

- Hue: E part--10YR or 7.5YR; Bt part--10YR or 7.5YR  
 Value: E part--6, 7, or 8 dry and 5, 6, or 7 moist; Bt part--4, 5, 6, or 7 dry and 3, 4, or 5 moist  
 Chroma: E part--1, 2, 3, or 4; Bt part--3, 4, or 6  
 Texture: Loam or sandy loam  
 Clay content: 10 to 25 percent and lamellae have less than 3 percent increase in clay  
 Content of rock fragments: 40 to 60 percent--0 to 20 percent cobbles and stones, 35 to 40 percent pebbles  
 Reaction: pH 6.1 to 7.3

## 179--Wildgen gravelly loam, 8 to 30 percent slopes

### Setting

- Landform:* Moraines  
*Slope:* 8 to 30 percent  
*Elevation:* 3,000 to 5,000 feet  
*Mean annual precipitation:* 18 to 22 inches  
*Frost-free period:* 90 to 105 days

### Composition

#### Major Components

Wildgen and similar soils: 85 percent

#### Minor Components

Finleypoint and similar soils: 0 to 5 percent  
 Sharrot and similar soils: 0 to 5 percent  
 Courville, dry soils: 0 to 3 percent  
 Trapps and similar soils: 0 to 2 percent

### Major Component Description

*Surface layer texture:* Gravelly loam

*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Alpine till  
*Native plant cover type:* Forest land  
*Flooding:* None  
*Available water capacity:* Mainly 5.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Forest Land" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

### 180--Wildgen very gravelly loam, 30 to 60 percent slopes

#### Setting

*Landform:* Mountains  
*Slope:* 30 to 60 percent  
*Elevation:* 3,000 to 5,000 feet  
*Mean annual precipitation:* 18 to 22 inches  
*Frost-free period:* 90 to 105 days

#### Composition

##### Major Components

Wildgen and similar soils: 85 percent

##### Minor Components

Courville, dry soils: 0 to 4 percent  
Finleypoint, dry soils: 0 to 4 percent  
Sharrot and similar soils: 0 to 4 percent  
Winkler and similar soils: 0 to 3 percent

#### Major Component Description

*Surface layer texture:* Very gravelly loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Alpine till  
*Native plant cover type:* Forest land

*Flooding:* None  
*Available water capacity:* Mainly 4.9 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Forest Land" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

### 181--Wildgen-Finleypoint gravelly loams, 15 to 30 percent slopes

#### Setting

*Landform:*  
\* Wildgen--Mountains  
\* Finleypoint--Mountains  
*Slope:*  
\* Wildgen--15 to 30 percent  
\* Finleypoint--15 to 30 percent  
*Elevation:* 3,000 to 5,000 feet  
*Mean annual precipitation:* 18 to 22 inches  
*Frost-free period:* 90 to 105 days

#### Composition

##### Major Components

Wildgen and similar soils: 45 percent  
Finleypoint and similar soils: 45 percent

##### Minor Components

Kingspoint and similar soils: 0 to 5 percent  
Trapps and similar soils: 0 to 5 percent

#### Major Component Description

##### Wildgen

*Surface layer texture:* Gravelly loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Alpine till  
*Native plant cover type:* Forest land

*Flooding:* None

*Available water capacity:* Mainly 5.1 inches

### **Finleypoint**

*Surface layer texture:* Gravelly loam

*Depth class:* Very deep (more than 60 inches)

*Drainage class:* Well drained

*Dominant parent material:* Alpine till

*Native plant cover type:* Forest land

*Flooding:* None

*Available water capacity:* Mainly 5.9 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### **Management**

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Forest Land" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

### **Winfall Series**

Winfall series consists of very deep, well drained soils on moraines and mountain slopes. These soils formed in alpine till. Slope is 4 to 60 percent. Elevation is 3,000 to 5,500 feet. The average annual precipitation is 25 to 35 inches, average annual air temperature is 40 to 43 degrees F, and the frost-free period is 60 to 90 days.

**Taxonomic Class:** Loamy-skeletal, mixed, frigid Dystric Eutrochrepts

### **Typical Pedon**

Winfall very gravelly loam, 30 to 60 percent slopes, in an area of woodland; approximately 1,800 feet south and 1,000 feet east of the northwest corner of sec. 3, T. 24 N., R. 22 W.

Oi--3 inches to 0; undecomposed needles and twigs.

E1--0 to 7 inches; light brownish gray (10YR 6/2) very gravelly loam, dark brown (10YR 4/3)

moist; weak fine granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots; 25 percent pebbles and 10 percent cobbles; slightly acid; clear smooth boundary.

E2--7 to 15 inches; light gray (10YR 7/2) very gravelly loam, brown (10YR 5/3) moist; weak fine granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots and common medium and coarse roots; common fine tubular pores; 40 percent pebbles and 10 percent cobbles; slightly acid; clear wavy boundary.

E3--15 to 26 inches; light gray (10YR 7/2) very gravelly sandy loam, brown (10YR 5/3) moist; weak fine and medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; many very fine and fine roots and common medium and coarse roots; common fine and medium tubular pores; 40 percent pebbles and 10 percent cobbles; slightly acid; clear wavy boundary.

E and Bt--26 to 60 inches; 80 percent is light gray (10YR 7/2) very gravelly sandy loam, grayish brown (10YR 5/2) moist (E part); 20 percent is pale brown (10YR 6/3) very gravelly sandy loam lamellae, 1/8- to 1/4-inch thick, brown (10YR 5/3) moist (B part); weak medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine and fine roots; common fine and medium tubular pores; 50 percent pebbles and 5 percent cobbles; slightly acid.

### **Range in Characteristics**

*Soil temperature:* 42 to 46 degrees F

*Moisture control section:* Between 8 to 24 inches

*Other features:* A thin A horizon may be present

#### *E horizons*

Hue: 5YR, 7.5YR, or 10YR

Value: 5, 6, or 7 dry; 4 or 5 moist

Chroma: 2, 3, or 4

Clay content: 10 to 20 percent

Content of rock fragments: 15 to 60 percent--0 to 10 percent cobbles and stones, 15 to 50 percent pebbles

Reaction: pH 5.1 to 6.5

#### *E and Bt horizon*

Hue: E part--5YR, 7.5YR, or 10YR; B part--5YR, 7.5YR, or 10YR

Value: E part--6 or 7 dry and 5 or 6 dry; B part--5 or 6 dry and 4 or 5 moist

Chroma: E part--2 or 3; B part--3 or 4

Texture: Loam, fine sandy loam, or sandy loam

Clay content: 10 to 20 percent and lamellae have less than 3 percent increase in clay  
Content of rock fragments: 35 to 60 percent--0 to 15 percent cobbles, 35 to 45 percent pebbles  
Reaction: pH 5.1 to 6.5

- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## 183--Winfall very gravelly loam, 15 to 30 percent slopes

## 182--Winfall very gravelly loam, 4 to 15 percent slopes

### Setting

### Setting

*Landform:* Moraines  
*Slope:* 15 to 30 percent  
*Elevation:* 3,000 to 5,500 feet  
*Mean annual precipitation:* 25 to 35 inches  
*Frost-free period:* 60 to 90 days

*Landform:* Moraines  
*Slope:* 4 to 15 percent  
*Elevation:* 3,000 to 5,500 feet  
*Mean annual precipitation:* 25 to 35 inches  
*Frost-free period:* 60 to 90 days

### Composition

### Composition

#### Major Components

Winfall and similar soils: 90 percent

#### Minor Components

Courville and similar soils: 0 to 5 percent

Wildgen and similar soils: 0 to 5 percent

#### Major Components

Winfall and similar soils: 85 percent

#### Minor Components

Courville and similar soils: 0 to 7 percent

Wildgen and similar soils: 0 to 6 percent

Poorly drained soils: 0 to 2 percent

### Major Component Description

### Major Component Description

*Surface layer texture:* Very gravelly loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Alpine till  
*Native plant cover type:* Forest land  
*Flooding:* None  
*Available water capacity:* Mainly 5.4 inches

*Surface layer texture:* Very gravelly loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Alpine till  
*Native plant cover type:* Forest land  
*Flooding:* None  
*Available water capacity:* Mainly 5.5 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### Management

### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Forest Land" section
- \* "Agronomy" section

- \* "Range" section
- \* "Forest Land" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## 184--Winfall very gravelly loam, 30 to 60 percent slopes

### Setting

*Landform:* Mountains

*Slope:* 30 to 60 percent

*Elevation:* 3,000 to 5,500 feet

*Mean annual precipitation:* 25 to 35 inches

*Frost-free period:* 60 to 90 days

### Composition

#### Major Components

Winfall and similar soils: 85 percent

#### Minor Components

Courville and similar soils: 0 to 5 percent

Tevis and similar soils: 0 to 5 percent

Wildgen and similar soils: 0 to 5 percent

### Major Component Description

*Surface layer texture:* Very gravelly loam

*Depth class:* Very deep (more than 60 inches)

*Drainage class:* Well drained

*Dominant parent material:* Alpine till

*Native plant cover type:* Forest land

*Flooding:* None

*Available water capacity:* Mainly 5.4 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Forest Land" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

### Winkler Series

Winkler series consists of very deep, somewhat excessively drained soils on mountain slopes. These soils formed in colluvium derived from

argillite and quartzite. Slope is 30 to 60 percent. Elevation is 3,000 to 5,000 feet. The average annual precipitation is 18 to 25 inches, average annual air temperature is 42 to 45 degrees F, and the frost-free period is 90 to 100 days.

**Taxonomic Class:** Loamy-skeletal, mixed, frigid Typic Ustochrepts

### Typical Pedon

Winkler very gravelly loam in an area of Winkler-Sharrott-Rock outcrop complex, 30 to 60 percent slopes, in woodland; approximately 1,900 feet east and 2,300 feet south of the northwest corner of sec. 17, T. 22 N., R. 22 W.

Oi--1 inch to 0; undecomposed needles and twigs.  
A--0 to 4 inches; light brownish gray (10YR 6/2) very gravelly loam, very dark grayish brown (10YR 4/2) moist; weak fine subangular blocky structure; soft, friable, slightly sticky and slightly plastic; many fine and very fine roots; many fine tubular pores and common fine interstitial pores; 50 percent angular pebbles and 5 percent angular cobbles; neutral; abrupt wavy boundary.

E1--4 to 14 inches; light gray (10YR 7/2) very gravelly loam, light brownish gray (10YR 6/2) moist; weak medium subangular blocky structure; soft, friable, nonsticky and nonplastic; many fine and very fine roots; many fine tubular pores and common medium interstitial pores; 50 percent angular pebbles and 5 percent angular cobbles; slightly acid; clear wavy boundary.

E2--14 to 24 inches; light gray (2.5Y 7/2) very gravelly loam, light brownish gray (2.5Y 6/2) moist; moderate coarse and medium subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; many very fine roots and common fine roots; many fine tubular and interstitial pores; 50 percent angular pebbles and 5 percent angular cobbles; slightly acid; clear wavy boundary.

E and Bt1--24 to 37 inches; 75 percent is light gray (2.5Y 7/2) extremely gravelly loam, light brownish gray (2.5Y 6/2) moist (E part); 25 percent is light olive brown (2.5Y 5/4) extremely gravelly loam lamellae, olive brown (2.5Y 4/4) moist (B part); moderate coarse and medium subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; few medium roots and common fine and very fine roots; many fine tubular and interstitial pores; 55 percent angular pebbles and 10 percent

angular cobbles; slightly acid; clear wavy boundary.  
E and Bt2--37 to 60 inches; 75 percent is light gray (2.5Y 7/2) extremely gravelly loam, light brownish gray (2.5Y 6/2) moist (E part); 25 percent is light olive brown (2.5Y 5/4) extremely gravelly loam lamellae, olive brown (2.5Y 4/4) moist (B part); weak coarse and medium subangular blocky structure; soft, friable, nonsticky and nonplastic; few fine and very fine roots; many fine tubular and interstitial pores; 60 percent angular pebbles and 15 percent angular cobbles; slightly acid.

### Range in Characteristics

*Soil temperature:* 42 to 47 degrees F

*Moisture control section:* Between 8 and 24 inches

#### A horizon

Hue: 7.5YR or 10YR

Value: 3 or 4 moist

Chroma: 2 or 3

Clay content: 7 to 15 percent

Content of rock fragments: 35 to 60 percent--0 to 5 percent angular cobbles, 35 to 55 percent angular pebbles

Reaction: pH 6.1 to 7.3

#### E1 horizon

Hue: 7.5YR or 10YR

Value: 6, 7, or 8 dry; 5, 6, or 7 moist

Chroma: 2, 3, or 4

Texture: Sandy loam or loam

Clay content: 5 to 15 percent

Content of rock fragments: 15 to 60 percent--0 to 5 percent angular cobbles, 15 to 55 percent angular pebbles

Reaction: pH 6.1 to 7.3

#### E2 horizon

Hue: 2.5Y, 7.5YR, or 10YR

Value: 6, 7, or 8 dry; 5, 6, or 7 moist

Chroma: 2, 3, or 4

Texture: Sandy loam or loam

Clay content: 5 to 15 percent

Content of rock fragments: 35 to 70 percent--0 to 10 percent angular cobbles, 35 to 60 percent angular pebbles

Reaction: pH 5.6 to 7.3

#### E and Bt horizons

Hue: E part--2.5Y, 7.5YR, or 10YR; B part--2.5Y, 5YR, 7.5YR, or 10YR

Value: E part--6, 7, or 8 dry and 5, 6, or 7 moist; B part--4, 5, or 6 dry and 4 or 5 moist

Chroma: E part--2, 3, or 4; B part--3 or 4

Texture: Fine sandy loam, sandy loam, or loam

Clay content: 5 to 15 percent and lamellae

have less than 5 percent increase in clay

Content of rock fragments: 60 to 85 percent--

10 to 25 percent angular cobbles, 50 to 60

percent angular pebbles

Reaction: pH 5.6 to 6.5

## 185--Winkler, cool-Rock outcrop complex, 30 to 60 percent slopes

### Setting

#### Landform:

\* Winkler--Mountains

\* Rock outcrop--Mountains

#### Position on landform:

\* Winkler--Back slopes

\* Rock outcrop--Shoulders and summits

#### Slope:

\* Winkler--30 to 60 percent

\* Rock outcrop--30 to 60 percent

*Elevation:* 3,000 to 3,900 feet

*Mean annual precipitation:* 18 to 25 inches

*Frost-free period:* 90 to 100 days

### Composition

#### Major Components

Winkler and similar soils: 65 percent

Rock outcrop: 25 percent

#### Minor Components

Finleypoint and similar soils: 0 to 3 percent

Sharrot and similar soils: 0 to 3 percent

Tevis and similar soils: 0 to 2 percent

Areas of rubble land: 0 to 2 percent

### Major Component Description

#### Winkler

*Surface layer texture:* Very gravelly loam

*Depth class:* Very deep (more than 60 inches)

*Drainage class:* Somewhat excessively drained

*Dominant parent material:* Colluvium

*Native plant cover type:* Forest land

*Flooding:* None

*Available water capacity:* Mainly 3.0 inches

#### Rock outcrop

*Definition:* Exposures of bare bedrock

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this

map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Forest Land" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

### 186--Winkler very gravelly loam, cool, 30 to 60 percent slopes

#### Setting

*Landform:* Mountains

*Slope:* 30 to 60 percent

*Elevation:* 3,000 to 5,000 feet

*Mean annual precipitation:* 18 to 25 inches

*Frost-free period:* 90 to 100 days

#### Composition

##### Major Components

Winkler and similar soils: 85 percent

##### Minor Components

Finley point and similar soils: 0 to 5 percent

Sharrot and similar soils: 0 to 4 percent

Wildgen and similar soils: 0 to 3 percent

Areas of rock outcrop: 0 to 3 percent

#### Major Component Description

*Surface layer texture:* Very gravelly loam

*Depth class:* Very deep (more than 60 inches)

*Drainage class:* Somewhat excessively drained

*Dominant parent material:* Colluvium

*Native plant cover type:* Forest land

*Flooding:* None

*Available water capacity:* Mainly 3.0 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

### Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Forest Land" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

### 187--Winkler-Sharrott-Rock outcrop complex, 30 to 60 percent slopes

#### Setting

*Landform:*

\* Winkler--Mountains

\* Sharrott--Mountains

*Position on landform:*

\* Winkler--Back slopes

\* Sharrott--Shoulders and summits

*Slope:*

\* Winkler--30 to 60 percent

\* Sharrott--30 to 60 percent

*Elevation:* 3,000 to 5,000 feet

*Mean annual precipitation:* 18 to 22 inches

*Frost-free period:* 90 to 100 days

#### Composition

##### Major Components

Winkler and similar soils: 45 percent

Sharrott and similar soils: 20 percent

Rock outcrop: 20 percent

##### Minor Components

Finley point, dry soils: 0 to 4 percent

Wildgen and similar soils: 0 to 4 percent

Winkler, cool soils: 0 to 4 percent

Areas of rubble land: 0 to 3 percent

#### Major Component Description

##### Winkler

*Surface layer texture:* Very gravelly loam

*Depth class:* Very deep (more than 60 inches)

*Drainage class:* Somewhat excessively drained

*Dominant parent material:* Colluvium

*Native plant cover type:* Forest land

*Flooding:* None

*Available water capacity:* Mainly 3.0 inches

## Sharrott

*Surface layer texture:* Very gravelly loam

*Depth class:* Shallow (10 to 20 inches)

*Drainage class:* Well drained

*Dominant parent material:* Argillite residuum

*Native plant cover type:* Forest land

*Flooding:* None

*Available water capacity:* Mainly 1.5 inches

## Rock outcrop

*Definition:* Exposures of bare bedrock

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

## Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Forest Land" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## Xerofluvents

Xerofluvents consist of very deep, somewhat poorly drained and moderately well drained soils on flood plains along stream channels. These soils formed in alluvium. Slope is 0 to 2 percent. Elevation is 2,600 to 3,400 feet. The average annual precipitation is 11 to 18 inches, average annual air temperature is 42 to 47 degrees F, and the frost-free period is 90 to 120 days.

## Typical Pedon

Xerofluvents, in an area of rangeland; 2,600 feet south and 100 feet west of the northeast corner of sec. 31, T. 19 N., R. 21 W.

A--0 to 3 inches; grayish brown (10YR 5/2) loam, dark brown (10YR 3/3) moist; moderate medium platy structure; soft, very friable, slightly sticky and slightly plastic; common fine roots; mildly alkaline; abrupt wavy boundary.

C1--3 to 12 inches; light gray (10YR 7/1) clay loam, gray (10YR 5/1) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; common fine roots; mildly alkaline; clear wavy boundary.

C2--12 to 36 inches; very pale brown (10YR 7/3) very gravelly sandy loam, brown (10YR 5/3) moist; massive; soft, very friable, nonsticky and nonplastic; few fine roots; 45 percent pebbles; moderately alkaline; gradual irregular boundary.

C3--36 to 60 inches; light brownish gray (10YR 6/2) extremely gravelly loamy sand, grayish brown (10YR 5/2) moist; single grain; loose, nonsticky and nonplastic; mildly alkaline.

## Range in Characteristics

### A horizon

Texture: Silt loam, loam, or sandy loam

Reaction: pH 6.6 to 7.8

### C horizons

Texture: Loamy sand to clay loam

Content of rock fragments: 0 to 65 percent

Reaction: pH 6.6 to 8.4

## 188--Xerofluvents, 0 to 2 percent slopes

### Setting

*Landform:* Flood plains

*Slope:* 0 to 2 percent

*Elevation:* 2,600 to 3,400 feet

*Mean annual precipitation:* 14 to 18 inches

*Frost-free period:* 90 to 110 days

### Composition

#### Major Components

Xerofluvents and similar soils: 90 percent

#### Minor Components

Poorly drained soils: 0 to 10 percent

### Major Component Description

*Depth class:* Very deep (more than 60 inches)

*Dominant parent material:* Alluvium

*Flooding:* Frequent

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

## Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

### 189--Xerofluvents, dry, 0 to 2 percent slopes

#### Setting

*Landform:* Flood plains

*Slope:* 0 to 2 percent

*Elevation:* 2,700 to 2,800 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 105 to 120 days

#### Composition

##### Major Components

Xerofluvents and similar soils: 90 percent

##### Minor Components

Bolack and similar soils: 0 to 5 percent

Kerl and similar soils: 0 to 5 percent

#### Major Component Description

*Depth class:* Very deep (more than 60 inches)

*Dominant parent material:* Alluvium

*Flooding:* Rare

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

## Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## Yellowbay Series

Yellowbay series consists of very deep, excessively drained soils on outwash plains. These soils formed in glacial outwash. Slope is 0 to 30 percent. Elevation is 2,900 to 4,000 feet. The average annual precipitation is 20 to 25 inches, average annual air temperature is 39 to 45 degrees F, and the frost-free period is 90 to 110 days.

**Taxonomic Class:** Sandy-skeletal, mixed, frigid Typic Xerochrepts

#### Typical Pedon

Yellowbay very gravelly loam, 0 to 4 percent slopes, in an area of woodland; approximately 400 feet north and 1,250 feet east of the southwest corner of sec. 18, T. 23 N., R. 19 W.

Oi--1 inch to 0; partially decomposed needles, twigs, and grass; neutral.

A--0 to 3 inches; dark grayish brown (10YR 4/2) very gravelly loam, very dark brown (10YR 2/2) moist; weak fine granular structure; soft, very friable, slightly sticky and nonplastic; many fine and medium roots; many fine and medium pores; 35 percent pebbles; neutral; clear irregular boundary.

Bw--3 to 22 inches; yellowish brown (10YR 5/4) extremely gravelly sandy loam, brown (10YR 4/3) moist; massive; soft, friable, nonsticky and nonplastic; many fine and medium roots; many fine and medium pores; 60 percent pebbles and 5 percent cobbles; neutral; gradual wavy boundary.

BC--22 to 60 inches; brown (10YR 5/3) extremely gravelly loamy sand, brown (10YR 4/3) moist; single grain; loose, nonsticky and nonplastic; common fine and medium roots in upper part of horizon and few below; common fine pores; 60 percent pebbles and 5 percent cobbles; neutral.

#### Range in Characteristics

*Soil temperature:* 41 to 47 degrees F

*Moisture control section:* Between 12 and 35 inches

*Control section:* Less than 35 percent medium and coarser sand

*Depth to BC horizon:* 17 to 26 inches

*A horizon*

Value: 4 or 5 dry; 2 or 3 moist

Chroma: 2 or 3

Clay content: 7 to 15 percent  
Content of rock fragments: 15 to 45 percent--0  
to 10 percent cobbles, 15 to 35 percent  
pebbles  
Reaction: pH 6.1 to 7.3

*Bw horizon*

Value: 5 or 6 dry; 4 or 5 moist  
Chroma: 3 or 4  
Clay content: 5 to 10 percent  
Content of rock fragments: 45 to 75 percent--5  
to 10 percent cobbles, 40 to 65 percent  
pebbles  
Reaction: pH 6.1 to 7.3

*BC horizon*

Value: 5 or 6 dry; 4 or 5 moist  
Chroma: 3 or 4  
Clay content: 2 to 5 percent  
Content of rock fragments: 55 to 80 percent--5  
to 10 percent cobbles, 45 to 70 percent  
pebbles  
Reaction: pH 6.1 to 7.3

**190--Yellowbay very gravelly loam, 0 to 4 percent slopes**

**Setting**

*Landform:* Outwash plains  
*Slope:* 0 to 4 percent  
*Elevation:* 2,900 to 4,000 feet  
*Mean annual precipitation:* 20 to 25 inches  
*Frost-free period:* 90 to 110 days

**Composition**

**Major Components**

Yellowbay and similar soils: 90 percent

**Minor Components**

Yellowbay with a dark surface: 0 to 10 percent

**Major Component Description**

*Surface layer texture:* Very gravelly loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Excessively drained  
*Dominant parent material:* Glacial outwash  
*Native plant cover type:* Forest land  
*Flooding:* None  
*Available water capacity:* Mainly 2.5 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this

map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

**Management**

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Forest Land" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

**191--Yellowbay very gravelly loam, 4 to 15 percent slopes**

**Setting**

*Landform:* Outwash plains  
*Slope:* 4 to 15 percent  
*Elevation:* 2,900 to 4,000 feet  
*Mean annual precipitation:* 20 to 25 inches  
*Frost-free period:* 90 to 110 days

**Composition**

**Major Components**

Yellowbay and similar soils: 85 percent

**Minor Components**

Yellowbay with a dark surface: 0 to 10 percent  
Gravelly loamy sand subsoil: 0 to 5 percent

**Major Component Description**

*Surface layer texture:* Very gravelly loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Excessively drained  
*Dominant parent material:* Glacial outwash  
*Native plant cover type:* Forest land  
*Flooding:* None  
*Available water capacity:* Mainly 2.7 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

## Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Forest Land" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections

## 192--Yellowbay very gravelly loam, 15 to 30 percent slopes

### Setting

*Landform:* Outwash plains

*Slope:* 15 to 30 percent

*Elevation:* 2,900 to 4,000 feet

*Mean annual precipitation:* 20 to 25 inches

*Frost-free period:* 90 to 110 days

### Composition

#### Major Components

Yellowbay and similar soils: 90 percent

#### Minor Components

Wildgen and similar soils: 0 to 5 percent

Finleypoint and similar soils: 0 to 5 percent

## Major Component Description

*Surface layer texture:* Very gravelly loam

*Depth class:* Very deep (more than 60 inches)

*Drainage class:* Excessively drained

*Dominant parent material:* Glacial outwash

*Native plant cover type:* Forest land

*Flooding:* None

*Available water capacity:* Mainly 2.4 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

## Management

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- \* "Range" section
- \* "Forest Land" section
- \* "Agronomy" section
- \* "Recreation" section
- \* "Wildlife Habitat" section
- \* "Engineering" and "Soil Properties" sections



# References

---

- (1) Aldin, W. C., 1953. Physiography and Glacial Geology of Western Montana, Geological Survey Professional Paper 231.
- (2) Alexander, R. R., 1967. Site index for lodgepole pine with corrections for stand density; instructions for field use. USDA, Forest Service. Rocky Mountain Forest and Range Experiment Station RM-24.
- (3) Alexander, R. R., 1957. Site indices for Engelmann spruce. USDA, Forest Service. Rocky Mountain Forest and Range Experiment Station RM-32.
- (4) American Association of State Highway and Transportation Officials. 1970. Standard specifications for highway materials and methods of sampling and testing. Ed. 10, 2 vol., illus.
- (5) American Society for Testing and Materials. 1974. Method for classification of soils for engineering purposes. ASTM Stand. D 2487-69.
- (6) Brickell, J. E., 1968. A method for constructing site index curves from measurements of tree age and height--its application to inland Douglas fir. USDA, Forest Service. Intermountain Forest and Range Experiment Station Research Paper INT-47.
- (7) Cummings, L. J., 1937. Larch-Douglas fir board foot yield tables. USDA, Forest Service. Rocky Mountain Forest and Range Experiment Station Applied Forestry Note 78.
- (8) Cummins, K. L., 1974. Impact Assessment: Forest Land of the Confederated Salish and Kootenai Tribes of the Flathead Indian Reservation, Montana, 481 pp., illus.
- (9) Dahms, W. G., 1964. Gross and net yield tables for lodgepole pine. USDA Forest Service. Pacific Northwest. USDA, Forest Service. Intermountain Forest and Range Experiment Station Research Paper PNW-8.
- (10) Haig, I. T., 1932. Second-growth yield, stand, and volume tables for the western white pine type. USDA Technical Bulletin No. 323.

- (11) Meyers, C. A., 1967. Yield tables for managed stands of lodgepole pine in Colorado and Wyoming. USDA, Forest Service. Rocky Mountain Forest and Range Experiment Station Research Paper RM-26.
- (12) Meyer, W. H., 1938. Yield of even-aged stands of ponderosa pine. USDA Technical Bulletin No. 630.
- (13) Montana Department of State Lands, Forestry Division and Forest Survey Intermountain Forest and Range Experiment Station. 1982. Timber Resources of Lincoln, Sanders, Flathead, and Lake Counties. 202 pp., illus.
- (14) Pfister, Robert D., Bernard L. Kovalchik, Steven F. Arno, and Richard C. Presby. 1977. Forest habitat types of Montana. U.S. Dep. Agric., Forest Serv., Intermountain Forest and Range Exp. Stn. Gen. Tech. Rep. INT-34.
- (15) Stoffel, Keith L., 1980. Masters Thesis, University of Montana, "Glacial Geology of the Southern Flathead Valley, Lake County, Montana."
- (16) The Channeled Scablands of Eastern Washington, U.S. Government Printing Office, USGS, Inf-72-2(R-1).
- (17) United States Department of Agriculture. 1993. Soil Survey Manual. U.S. Dep. Agric. Handb. 18, 503 pp., illus.
- (18) United States Department of Agriculture. 1961. Land Capability Classification. U.S. Dep. Agric. Handb. 210, 21 pp.
- (19) United States Department of Agriculture. 1975. Soil Taxonomy: A basic system of soil classification for making and interpreting soil surveys. Soil Conserv. Serv., U.S. Dep. Agric. Handb. 436, 754 pp., illus.
- (20) United States Department of Agriculture. July 1976. National Range Handbook.
- (21) United States Department of Interior. Forest Management Plan, Flathead Indian Reservation, Montana. 402 pp., illus. Compiled by Robert W. Miller. Bureau of Indian Affairs, 1975.

# Glossary

---

**Ablation till.** Loose, permeable till deposited during the final downwasting of glacial ice. Lenses of crudely sorted sand and gravel are common.

**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.

**Alluvial fan.** A body of alluvium, with overflow of water and debris flow deposits, whose surface forms a segment of a cone that radiates downslope from the point where the stream emerges from a narrow valley onto a less sloping surface. Source uplands range in relief and areal extent from mountains to gullied terrains on hill slopes.

**Alluvium.** Material, such as sand, silt, or clay, deposited on land by streams.

**Animal-unit-month (AUM).** The amount of forage required by one mature cow of approximately 1,000 pounds weight, with or without a calf, for 1 month.

**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.

**Argillite.** Weakly metamorphosed mudstone or shale.

**Association, soil.** A group of soils or miscellaneous areas 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:

Very low .....	0 to 3.75
Low .....	3.75 to 5.0
Moderate .....	5.0 to 7.5
High.....	More than 7.5

**Avalanche chute.** The track or path formed by an avalanche.

**Back slope.** The geomorphic component that forms the steepest inclined surface and principal element of many hill slopes. Back slopes in profile are commonly steep and linear and descend to a foot slope. In terms of gradational process, back slopes are erosional forms produced mainly by mass wasting and running water.

**Badland.** Steep or very steep, commonly nonstony, barren land dissected by many intermittent drainage channels. Badland is most common in semiarid and arid regions where streams are entrenched in soft geologic material. Local relief generally ranges from 25 to 500 feet. Runoff potential is very high, and geologic erosion is active.

**Basal area.** The area of a cross section of a tree, generally referring to the section at breast height and measured outside the bark. It is a measure of stand density, commonly expressed in square feet.

**Basal till.** Compact glacial till deposited beneath the ice.

**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.

**Bedding planes.** Fine strata, less than 5 millimeters thick, in unconsolidated alluvial, eolian, lacustrine, or marine sediment.

**Bedrock.** The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

**Bedrock-floored plain.** An extensive nearly level to gently rolling or moderately sloping area that is underlain by hard bedrock and has a slope of 0 to 8 percent.

**Bench terrace.** A raised, level or nearly level strip of earth constructed on or nearly on a contour, supported by a barrier of rocks or similar material, and designed to make the soil suitable for tillage and to prevent accelerated erosion.

**Blowout.** A shallow depression from which all or most of the soil material has been removed by the wind. A blowout has a flat or irregular floor formed by a resistant layer or by an accumulation of pebbles or cobbles. In some blowouts the water table is exposed.

**Board foot.** A unit of measure of the wood in lumber, logs, or trees. The amount of wood in a board one foot wide, one foot long, and one inch thick before finishing.

**Bottom land.** The normal flood plain of a stream, subject to flooding.

**Boulders.** Rock fragments larger than 2 feet (60 centimeters) in diameter.

**Breaks.** The steep or very steep broken land at the border of an upland summit that is dissected by ravines.

**Breast height.** An average height of 4.5 feet above the ground surface; the point on a tree where diameter measurements are ordinarily taken.

**Brush management.** Use of mechanical, chemical, or biological methods to reduce or eliminate competition from woody vegetation and thus to allow understory grasses and forbs to recover or to make conditions favorable for reseeding. Brush management increases forage production and thus reduces the hazard of erosion. It can improve the habitat for some species of wildlife.

**Cable yarding.** A method of moving felled trees to a nearby central area for transport to a processing facility. Most cable yarding systems involve use of a drum, a pole, and wire cables in an arrangement similar to that of a rod and reel used for fishing. To reduce friction and soil disturbance, a felled tree generally is reeled in while one end is lifted or the entire log is suspended.

**Calcareous soil.** A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly

when treated with cold, dilute hydrochloric acid.

**Caliche.** A more or less cemented deposit of calcium carbonate in soils of warm-temperate, subhumid to arid areas. Caliche occurs as soft, thin layers in the soil or as hard, thick beds just beneath the solum, or it is exposed at the surface by erosion.

**California bearing ratio (CBR).** The load-supporting capacity of a soil as compared to that of standard crushed limestone, expressed as a ratio. First standardized in California. A soil having a CBR of 16 supports 16 percent of the load that would be supported by standard crushed limestone, per unit area, with the same degree of distortion.

**Canopy.** The leafy crown of trees or shrubs. (See Crown.)

**Capillary water.** Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

**Cation.** An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

**Cation-exchange capacity.** The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

**Catsteps.** Very small, irregular terraces on steep hillsides, especially in pasture, formed by the trampling of cattle or the slippage of saturated soil.

**Channeled.** Refers to a drainage area in which natural meandering or repeated branching and convergence of a streambed have created deeply incised cuts, either active or abandoned, in alluvial material.

**Channery soil.** A soil that is, by volume, more than 15 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches along the longest axis. A single piece is called a channer.

**Chemical treatment.** Control of unwanted vegetation by use of chemicals.

**Chiseling.** Tillage with an implement having one or more soil-penetrating points that loosen the subsoil and bring clods to the surface. A form of emergency tillage to control soil blowing.

**Cirque.** A semicircular, concave, bowl-like area that has steep faces primarily resulting from erosive activity of a mountain glacier.

**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.

**Clayey soil.** Silty clay, sandy clay, or clay.

**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.

**Claypan.** A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

**Clearcut.** A method of forest harvesting that removes the entire stand of trees in one cutting. Reproduction is achieved artificially or by natural seeding from adjacent stands.

**Climax plant community.** The plant community on a given site that will be established if present environmental conditions continue to prevail and the site is properly managed.

**Closed depression.** A low area completely surrounded by higher ground and having no natural outlet.

**Coarse textured soil.** Sand or loamy sand.

**Cobble (or cobblestone).** A rounded or partly rounded fragment of rock 3 to 10 inches (7.6 to 25 centimeters) in diameter.

**Cobbly soil material.** Material that is 15 to 35 percent, by volume, rounded or partially rounded rock fragments 3 to 10 inches (7.6 to 25 centimeters) in diameter. Very cobbly soil material is 35 to 60 percent of these rock fragments, and extremely cobbly soil material is more than 60 percent.

**Codominant trees.** Trees whose crowns form the general level of the forest canopy and that receive full light from above but comparatively little from the sides.

**Colluvium.** Soil material, rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.

**Commercial forest.** Forest land capable of producing 20 cubic feet or more per acre per year at the culmination of mean annual increment.

**Complex slope.** Irregular or variable slope. Planning or establishing terraces, diversions, and other water-control structures on a complex slope is difficult.

**Complex, soil.** A map unit of two or more kinds of soil or miscellaneous areas 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 or miscellaneous areas are somewhat similar in all areas.

**Compressible (in tables).** Excessive decrease in volume of soft soil under load.

**Concretions.** Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

**Conglomerate.** A coarse grained, clastic rock composed of rounded to subangular rock fragments more than 2 millimeters in diameter. It commonly has a matrix of sand and finer material. Conglomerate is the consolidated equivalent of gravel.

**Conservation cropping system.** Growing crops in combination with needed cultural and management practices. In a good conservation cropping system, the soil-improving crops and practices more than offset the soil-depleting crops and practices. Cropping systems are needed on all tilled soils. Soil-improving practices in a conservation cropping system include the use of rotations that contain grasses and legumes and the return of crop residue to the soil. Other practices include the use of green manure crops of grasses and legumes, proper tillage, adequate fertilization, and weed and pest control.

**Conservation tillage.** Any tillage and planting system in which a cover of crop residue is maintained on at least 30 percent of the soil surface after planting in order to reduce the hazard of water erosion; in areas where soil blowing is the primary concern, a system that maintains a cover of at least 1,000 pounds of flat residue of small grain or the equivalent during the critical erosion period.

**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.*--Readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

*Sticky.*--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.

**Consolidated sandstone.** Sandstone that disperses within a few hours when fragments are placed in water. The fragments are extremely hard or very hard when dry, are not easily crushed, and cannot be textured by the usual field method.

**Consolidated shale.** Shale that disperses within a few hours when fragments are placed in water. The fragments are extremely hard or very hard when dry and are not easily crushed.

**Contour stripcropping (or contour farming).** Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

**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.

**Coprogenous earth (sedimentary peat).** Fecal material deposited in water by aquatic organisms.

**Corrosion.** Soil-induced electrochemical or chemical action that dissolves or weakens concrete or uncoated steel.

**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.

**Cropping system.** Growing crops according to a planned system of rotation and management practices.

**Crop residue management.** Returning crop residue to the soil, which helps to maintain soil structure, organic matter content, and fertility and helps to control erosion.

**Cross-slope farming.** Deliberately conducting farming operations on sloping farmland in

such a way that tillage is across the general slope.

**Crown.** The upper part of a tree or shrub, including the living branches and their foliage.

**Culmination of the mean annual increment (CMAI).** The average annual increase per acre in the volume of a stand. Computed by dividing the total volume of the stand by its age. As the stand increases in age, the mean annual increment continues to increase until mortality begins to reduce the rate of increase. The point where the stand reaches its maximum annual rate of growth is called the culmination of the mean annual increment.

**Cutbanks cave** (in tables). The walls of excavations tend to cave in or slough.

**Decreasers.** The most heavily grazed climax range plants. Because they are the most palatable, they are the first to be destroyed by overgrazing.

**Deep soil.** A soil that is 40 to 60 inches deep over bedrock or to other material that restricts the penetration of plant roots.

**Deferred grazing.** Postponing grazing or arresting grazing for a prescribed period.

**Dense layer** (in tables). A very firm, massive layer that has a bulk density of more than 1.8 grams per cubic centimeter. Such a layer affects the ease of digging and can affect filling and compacting.

**Depth to rock** (in tables). Bedrock is too near the surface for the specified use.

**Dip slope.** A slope of the land surface, roughly determined by and approximately conforming with the dip of underlying bedded rock.

**Diversion (or diversion terrace).** A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

**Divided-slope farming.** A form of field stripcropping in which crops are grown in a systematic arrangement of two strips, or bands, across the slope to reduce the hazard of water erosion. One strip is in a close-growing crop that provides protection from erosion, and the other strip is in a crop that provides less protection from erosion. This practice is used where slopes are not long enough to permit the use of a full stripcropping pattern.

**Dominant trees.** Trees whose crowns form the general level of the forest canopy and that receive full light from above and from the sides.

**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.*--These soils have very high and high hydraulic conductivity and a low water-holding capacity. They are not suited to crop production unless irrigated.

*Somewhat excessively drained.*--These soils have high hydraulic conductivity and a low water-holding capacity. Without irrigation, only a narrow range of crops can be grown and yields are low.

*Well drained.*--These soils have an intermediate water-holding capacity. They retain optimum amounts of moisture, but they are not wet close enough to the surface or long enough during the growing season to adversely affect yields.

*Moderately well drained.*--These soils are wet close enough to the surface or long enough that planting or harvesting operations or yields of some field crops are adversely affected unless a drainage system is installed.

Moderately well drained soils commonly have a layer with low hydraulic conductivity, a wet layer relatively high in the profile, additions of water by seepage, or some combination of these.

*Somewhat poorly drained.*--These soils are wet close enough to the surface or long enough that planting or harvesting operations or crop growth is markedly restricted unless a drainage system is installed. Somewhat poorly drained soils commonly have a layer with low hydraulic conductivity, a wet layer high in the profile, additions of water through seepage, or a combination of these.

*Poorly drained.*--These soils commonly are so wet at or near the surface during a considerable part of the year that field crops cannot be grown under natural conditions. Poorly drained conditions are caused by a saturated zone, a layer with low hydraulic conductivity, seepage, or a combination of these.

*Very poorly drained.*--These soils are wet to the surface most of the time. The wetness prevents the growth of important crops (except rice) unless a drainage system is installed.

**Drainage, surface.** Runoff, or surface flow of water, from an area.

**Drainageway.** An area of ground at a lower elevation than the surrounding ground and in which water collects and is drained to a closed depression or lake or to a drainageway at a lower elevation. A drainageway may or may not have distinctly incised channels at its upper reaches or throughout its course.

**Drumlin.** A low, smooth, elongated oval hill, mound, or ridge of compact glacial till. The longer axis is parallel to the path of the glacier and commonly has a blunt nose pointing in the direction from which the ice approached.

**Duff.** A term used to identify a generally firm organic layer on the surface of mineral soils. It consists of fallen plant material that is in the process of decomposition and includes everything from the litter on the surface to underlying pure humus.

**Dune.** A mound, ridge, or hill of loose, windblown granular material (generally sand), either bare or covered with vegetation.

**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.

**Ephemeral stream.** A stream, or reach of a stream, that flows only in direct response to precipitation. It receives no long-continued supply from melting snow or other source, and its channel is above the water table at all times.

**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 human or animal activities or of a catastrophe in nature, for example, fire, that exposes the surface.

**Erosion pavement.** A layer of gravel or stones that remains on the surface after fine particles are removed by sheet or rill erosion.

**Escarpment.** A relatively continuous and steep slope or cliff breaking the general continuity of more gently sloping land surfaces and resulting from erosion or faulting. The term is more often applied to cliffs resulting from differential erosion.

**Esker.** A long, narrow, sinuous, steep-sided ridge composed of irregularly stratified sand and gravel that were deposited by a subsurface stream flowing between ice walls or through ice tunnels of a retreating glacier and that were left behind when the ice melted. Eskers range from less than a mile to more than 100 miles in length and from 10 to 100 feet in height.

**Even aged.** Refers to a stand of trees in which only small differences in age occur between the individuals. A range of 20 years is allowed.

**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.

**Excess sodium** (in tables). Excess exchangeable sodium in the soil. The resulting poor physical properties restrict the growth of plants.

**Excess sulfur** (in tables). Excessive amount of sulfur in the soil. The sulfur causes extreme acidity if the soil is drained, and the growth of most plants is restricted.

**Extrusive rock.** Igneous rock derived from deep-seated molten matter (magma) emplaced on the earth's surface.

**Fallow.** Cropland left idle in order to restore productivity through accumulation of moisture. Summer fallow is common in regions of limited rainfall where cereal grain is 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.

**Fibric soil material (peat).** The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical

origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

**Field moisture capacity.** The moisture content of a soil, expressed as a percentage of the oven-dry 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, or clay.

**Firebreak.** An area cleared of flammable material to stop or help control creeping or running fires. A firebreak also serves as a line from which to work and to facilitate the movement of fire fighters and equipment. Designated roads also serve as firebreaks.

**First bottom.** The normal flood plain of a stream, subject to frequent or occasional flooding.

**Flaggy soil material.** Material that is, by volume, 15 to 35 percent flagstones. Very flaggy soil material is 35 to 60 percent flagstones, and extremely flaggy soil material is more than 60 percent flagstones.

**Flagstone.** A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist 6 to 15 inches (15 to 38 centimeters) long.

**Flood plain.** A nearly level alluvial plain that borders a stream and is subject to inundation under flood-stage conditions unless protected artificially. It is usually a constructional landform built of sediment deposited during overflow and lateral migration of the stream.

**Fluvial.** Of or pertaining to rivers; produced by river action, as a fluvial plain.

**Foothills.** A region of relatively low, rounded hills at the base of a mountain range.

**Foot slope.** The geomorphic component that forms the inner, gently inclined surface at the base of a hill slope. The surface profile is dominantly concave. In terms of gradational processes, a foot slope is a transition zone between an upslope site of erosion (back slope) and a downslope site of deposition (toe slope).

**Forb.** Any herbaceous plant not a grass or a sedge.

**Forest cover.** All trees and other woody plants (underbrush) covering the ground in a forest.

**Forest type.** A stand of trees similar in composition and development because of given physical and biological factors by which it may be differentiated from other stands.

**Fragile** (in tables). A soil that is easily damaged by use or disturbance.

- Fragipan.** A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.
- Frost action** (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.
- Giant ripple mark.** The undulating surface sculpture produced in noncoherent granular materials by currents of water and by the agitation of water in wave action during the draining of large glacial lakes, such as Glacial Lake Missoula.
- Glacial drift** (geology). Pulverized and other rock material transported by glacial ice and then deposited. Also, the sorted and unsorted material deposited by streams flowing from glaciers.
- Glacial outwash** (geology). Gravel, sand, and silt, commonly stratified, deposited by glacial meltwater.
- Glacial till** (geology). Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.
- Glaciated uplands.** Land areas that were previously covered by continental or alpine glaciers and that are at a higher elevation than the flood plain.
- Glaciofluvial deposits** (geology). Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. The deposits are stratified and occur as kames, eskers, deltas, and outwash plains.
- Glaciolacustrine deposits.** Material ranging from fine clay to sand derived from glaciers and deposited in glacial lakes mainly by glacial meltwater. Many deposits are interbedded or laminated.
- 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.
- Grassed waterway.** A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.
- Gravel.** Rounded or angular fragments of rock as much as 3 inches (2 millimeters to 7.6 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, as much as 3 inches (7.6 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 the 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. A gullied map unit is one that has numerous gullies.
- Gypsum.** A mineral consisting of hydrous calcium sulfate.
- Hard bedrock.** Bedrock that cannot be excavated except by blasting or by the use of special equipment that is not commonly used in construction.
- 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.
- Head out.** To form a flower head.
- Heavy metal.** Inorganic substances that are solid at ordinary temperatures and are not soluble in water. They form oxides and hydroxides that are basic. Examples are copper, iron, cadmium, zinc, manganese, lead, and arsenic.
- Hemic soil material (mucky peat).** Organic soil material intermediate in degree of decomposition between the less decomposed fibric material and the more decomposed sapric material.
- High-residue crops.** Such crops as small grain and corn used for grain. If properly managed, residue from these crops can be used to control erosion until the next crop in the rotation is established. These crops return large amounts of organic matter to the soil.

**Hill.** A natural elevation of the land surface, rising as much as 1,000 feet above surrounding lowlands, commonly of limited summit area and having a well defined outline; hillsides generally have slopes of more than 8 percent. The distinction between a hill and a mountain is arbitrary and is dependent on local usage.

**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 uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. The major horizons of mineral soil are as follows:

*O horizon.*--An organic layer of fresh and decaying plant residue.

*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.

*E horizon.*--The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

*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 overlying soil material. 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 number 2 precedes the letter C.

*Cr horizon.*--Sedimentary beds of consolidated sandstone and semiconsolidated and consolidated shale. Generally, roots can penetrate this horizon only along fracture planes.

*R layer.*--Hard, consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon but can be directly below an A or a B horizon.

**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.

**Igneous rock.** Rock formed by solidification from a molten or partially molten state. Major varieties include plutonic and volcanic rock. Examples are andesite, basalt, and granite.

**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.

**Increasesers.** Species in the climax vegetation that increase in amount as the more desirable plants are reduced by close grazing. Increasesers commonly are the shorter plants and are less palatable to livestock.

**Infiltration.** The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

**Infiltration 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

**Intermittent stream.** A stream, or reach of a stream, that flows for prolonged periods only when it receives ground-water discharge or long, continued contributions from melting snow or other surface and shallow subsurface sources.

**Invaders.** On range, plants that encroach into an area and grow after the climax vegetation has been reduced by grazing. Generally, plants invade following disturbance of the surface.

**Irrigation.** Application of water to soils to assist in production of crops. Methods of irrigation are:

*Basin.*--Water is applied rapidly to nearly level plains surrounded by levees or dikes.

*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.

*Corrugation.*--Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

*Drip (or trickle).*--Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

*Furrow.*--Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

*Sprinkler.*--Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

*Subirrigation.*--Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

*Wild flooding.*--Water, released at high points, is allowed to flow onto an area without controlled distribution.

**Kame.** A moundlike hill of glacial drift, composed chiefly of stratified sand and gravel.

**Kame terrace.** A terracelike ridge consisting of stratified sand and gravel that were deposited by a meltwater stream flowing between a melting glacier and a higher valley wall or lateral moraine and that remained after the disappearance of the ice. It is commonly pitted with kettles and has an irregular ice-contact slope.

**Lacustrine deposit** (geology). Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

**Lake plain.** A surface marking the floor of an extinct lake, filled in by well sorted, stratified sediments.

**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 (7.6 centimeters) or more across. Large stones adversely affect the specified use of the soil.

**Lateral moraine.** A ridgelike moraine carried on and deposited at the side margin of a valley glacier. It is composed chiefly of rock fragments derived from the valley walls by glacial abrasion and plucking or by mass wasting.

**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.

**Loamy soil.** Coarse sandy loam, sandy loam, fine sandy loam, very fine sandy loam, loam, silt loam, silt, clay loam, sandy clay loam, or silty clay loam.

**Loess.** Fine grained material, dominantly of silt-sized particles, deposited by the wind.

**Low-residue crops.** Crops such as corn used for silage, peas, beans, and potatoes. Residue from these crops is not adequate to control erosion until the next crop in the rotation is established. These crops return little organic matter to the soil.

**Low strength.** The soil is not strong enough to support loads.

**Marl.** An earthy, unconsolidated deposit consisting chiefly of calcium carbonate mixed with clay in approximately equal amounts.

- Mean annual increment (MAI).** The average annual increase in volume of a tree during the entire life of the tree.
- Mechanical treatment.** Use of mechanical equipment for seeding, brush management, and other management practices.
- Medium textured soil.** Very fine sandy loam, loam, silt loam, or silt.
- Merchantable trees.** Trees that are of sufficient size to be economically processed into wood products.
- 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.
- Microhigh.** An area that is 2 to 12 inches higher than the adjacent microlow.
- Microlow.** An area that is 2 to 12 inches lower than the adjacent microhigh.
- 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.
- Miscellaneous water.** Areas of sewerage lagoons, industrial waste pits, and fish hatcheries, etc.
- Moderately coarse textured soil.** Coarse sandy loam, sandy loam, or fine sandy loam.
- Moderately deep soil.** A soil that is 20 to 40 inches deep over bedrock or to other material that restricts the penetration of plant roots.
- Moderately fine textured soil.** Clay loam, sandy clay loam, or silty clay loam.
- Moraine.** An accumulation of glacial drift in a topographic landform of its own, resulting chiefly from the direct action of glacial ice. Some types are lateral, recessional, and terminal.
- 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).
- Mountain.** A natural elevation of the land surface, rising more than 1,000 feet above surrounding lowlands, commonly of limited summit area and generally having steep sides (slopes greater than 25 percent) and considerable bare-rock surface. A mountain can occur as a single, isolated mass or in a group forming a chain or range. Mountains are primarily formed by deep-seated earth movements or volcanic action and secondarily by differential erosion.
- Muck.** Dark, finely divided, well decomposed organic soil material. (See Sapric soil material.)
- Mudstone.** Sedimentary rock formed by induration of silt and clay in approximately equal amounts.
- Munsell notation.** A designation of color by degrees of three simple variables--hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with hue of 10YR, 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.
- Observed rooting depth.** Depth to which roots have been observed to penetrate.
- Organic matter.** Plant and animal residue in the soil in various stages of decomposition.
- Outwash plain.** An extensive area of glaciofluvial material that was deposited by meltwater streams.
- Overstory.** The trees in a forest that form the upper crown cover.
- Oxbow.** The horseshoe-shaped channel of a former meander, remaining after the stream formed a cutoff across a narrow meander neck.
- Pan.** A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *hardpan*, *fragipan*, *claypan*, *plowpan*, and *traffic pan*.
- Parent material.** The unconsolidated organic and mineral material in which soil forms.

**Peat.** Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture. (See Fibric soil material.)

**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 0.2 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, such as 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.

**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.

**Playa.** The generally dry and nearly level lake plain that occupies the lowest parts of closed depressional areas, such as those on intermontane basin floors. Temporary flooding occurs primarily in response to precipitation and runoff.

**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.

**Poor filter** (in tables). Because of rapid permeability or an impermeable layer near the surface, the soil may not adequately filter effluent from a waste disposal system.

**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.

**Poor outlets** (in tables). Refers to areas where surface or subsurface drainage outlets are difficult or expensive to install.

**Potential native plant community.** See Climax plant community.

**Potential rooting depth (effective rooting depth).** Depth to which roots could penetrate if the content of moisture in the soil were adequate. The soil has no properties restricting the penetration of roots to this depth.

**Prescribed burning.** The application of fire to land under such conditions of weather, soil moisture, and time of day as presumably will result in the intensity of heat and spread required to accomplish specific forest management, wildlife, grazing, or fire hazard reduction purposes.

**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.

**Proper grazing use.** Grazing at an intensity that maintains enough cover to protect the soil and maintain or improve the quantity and quality of the desirable vegetation. This practice increases the vigor and reproduction capacity of the key plants and promotes the accumulation of litter and mulch necessary to conserve soil and water.

**Quartzite, metamorphic.** Rock consisting mainly of quartz that formed through recrystallization of quartz-rich sandstone or chert.

**Quartzite, sedimentary.** Very hard but unmetamorphosed sandstone consisting chiefly of quartz grains.

**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.

**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 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 degrees of acidity or alkalinity, expressed as pH values, are:

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

**Recessional moraine.** A moraine formed during a temporary but significant halt in the retreat of a glacier.

**Red beds.** Sedimentary strata mainly red in color and composed largely of sandstone and shale.

**Regeneration.** The new growth of a natural plant community, developing from seed.

**Regolith.** The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock.

**Relict stream terrace.** One of a series of platforms in or adjacent to a stream valley that formed prior to the current stream system.

**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.

**Riser.** The relatively short, steeply sloping area below a terrace tread that grades to a lower terrace tread or base level.

**Riverwash.** Unstable areas of sandy, silty, clayey, or gravelly sediments. These areas are flooded, washed, and reworked by rivers so frequently that they support little or no vegetation.

**Road cut.** A sloping surface produced by mechanical means during road construction. It is commonly on the uphill side of the road.

**Rock fragments.** Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

**Rock outcrop.** Exposures of bare bedrock other than lava flows and rock-lined pits.

**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.

**Rubble land.** Areas that have more than 90 percent of the surface covered by stones or boulders. Voids contain no soil material and virtually no vegetation other than lichens. The areas commonly are at the base of mountain slopes, but some are on mountain slopes as deposits of cobbles, stones, and boulders left by Pleistocene glaciation or by periglacial phenomena.

**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 the growth of plants. A saline soil does not contain excess exchangeable sodium.

**Salinity.** The electrical conductivity of a saline soil. It is expressed, in millimhos per centimeter, as follows:

Nonsaline .....	0 to 4
Slightly saline .....	4 to 8
Moderately saline.....	8 to 16
Strongly saline.....	More than 16

**Salty water (in tables).** Water that is too salty for consumption by livestock.

- 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-sized particles.
- Sandy soil.** Sand or loamy sand.
- Sapric soil material (muck).** The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.
- Sawlogs.** Logs of suitable size and quality for the production of lumber.
- Scarification.** The act of abrading, scratching, loosening, crushing, or modifying the surface to increase water absorption or to provide a more tillable soil.
- Scribner's log rule.** A method of estimating the number of board feet that can be cut from a log of a given diameter and length.
- Sedimentary plain.** An extensive nearly level to gently rolling or moderately sloping area that is underlain by sedimentary bedrock and that has a slope of 0 to 8 percent.
- 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.
- Sedimentary uplands.** Land areas of bedrock formed from water- or wind-deposited sediments. They are higher on the landscape than the flood plain.
- Seepage** (in tables). The movement of water through the soil. Seepage adversely affects the specified use.
- Semiconsolidated sedimentary beds.** Soft geologic sediments that disperse when fragments are placed in water. The fragments are hard or very hard when dry. Determining the texture by the usual field method is difficult.
- 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.
- Shallow soil.** A soil that is 10 to 20 inches deep over bedrock or to other material that restricts the penetration of plant roots.
- Sheet erosion.** The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.
- Shelterwood system.** A forest management system requiring the removal of a stand in a series of cuts so that regeneration occurs under a partial canopy. After regeneration, a final cut removes the shelterwood and allows the stand to develop in the open as an even-aged stand. The system is well suited to sites where shelter is needed for regeneration, and it can aid regeneration of the more intolerant tree species in a stand.
- Shoulder slope.** The uppermost inclined surface at the top of a hillside. It is the transition zone from the back slope to the summit of a hill or mountain. The surface is dominantly convex in profile and erosional in origin.
- Shrink-swell** (in tables). 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.
- Similar soils.** Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.
- Sinkhole.** A depression in the landscape where limestone has been dissolved.
- Site class.** A grouping of site indexes into five to seven production capability levels. Each level can be represented by a site curve.
- Site curve (50-year).** A set of related curves on a graph that shows the average height of dominant or dominant and codominant trees for the range of ages on soils that differ in productivity. Each level is represented by a curve. The basis of the curves is the height of

dominant or dominant and codominant trees that are 50 years old or are 50 years old at breast height.

**Site curve (100-year).** A set of related curves on a graph that shows the average height of dominant or dominant and codominant trees for a range of ages on soils that differ in productivity. Each level is represented by a curve. The basis of the curves is the height of dominant or dominant and codominant trees that are 100 years old or are 100 years old at breast height.

**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 or dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75.

**Skid trails.** Pathways along which logs are dragged to a common site for loading onto a logging truck.

**Slash.** The branches, bark, treetops, reject logs, and broken or uprooted trees left on the ground after logging.

**Slickens.** Accumulations of fine-textured material, such as material separated in placer-mine and ore-mill operations. Slickens from ore mills commonly consist of freshly ground rock that has undergone chemical treatment during the milling process.

**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 generally is loamy 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. In this survey the following slope classes are recognized:

Nearly level .....	0 to 2 percent
Gently sloping.....	2 to 4 percent
Moderately sloping.....	4 to 8 percent
Strongly sloping.....	8 to 15 percent
Moderately steep .....	15 to 25 percent
Steep.....	25 to 45 percent
Very steep .....	More than 45 percent

**Slope (in tables).** Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

**Slow intake (in tables).** The slow movement of water into the soil.

**Slow refill (in tables).** The slow filling of ponds, resulting from restricted permeability in the soil.

**Small stones (in tables).** Rock fragments less than 3 inches (7.6 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

**Sodic (alkali) 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.

**Sodicity.** The degree to which a soil is affected by exchangeable sodium. Sodicity is expressed as a sodium adsorption ratio (SAR) of a saturation extract, or the ratio of  $Na^+$  to  $Ca^{++} + Mg^{++}$ . The degrees of sodicity and their respective ratios are:

Slight.....	Less than 13:1
Moderate .....	13-30:1
Strong.....	More than 30:1

**Soft bedrock.** Bedrock that can be excavated with trenching machines, backhoes, small rippers, and other equipment commonly used in construction.

**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 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized

in the United States are as follows:

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, E, 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.

**Species.** A single, distinct kind of plant or animal having certain distinguishing characteristics.

**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 if rounded or 15 to 24 inches (38 to 60 centimeters) in length if flat.

**Stony.** Refers to a soil containing stones in numbers that interfere with or prevent tillage.

**Strath terrace.** A surface cut formed by the erosion of hard or semiconsolidated bedrock and thinly mantled with stream deposits.

**Stream channel.** The hollow bed where a natural stream of surface water flows or may flow; the deepest or central part of the bed, formed by the main current and covered more or less continuously by water.

**Stream terrace.** One of a series of platforms in a stream valley, flanking and more or less parallel to the stream channel. It originally formed near the level of the stream and is the dissected remnants of an abandoned flood plain, streambed, or valley floor that were produced during a former stage of erosion or deposition.

**Stripcropping.** Growing crops in a systematic arrangement of strips or bands that provide vegetative barriers to soil blowing 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 grain* (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 or loosen a layer that is restrictive to roots.

**Substratum.** The part of the soil below the solum.

**Subsurface layer.** Technically, the E 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.

**Summit.** A general term for the top, or highest level, of an upland feature, such as a hill or mountain. It commonly refers to a higher area that has a gentle slope and is flanked by steeper slopes.

**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."

**Tailwater.** The water directly downstream of a structure.

**Talus.** Rock fragments of any size or shape, commonly coarse and angular, derived from and lying at the base of a cliff or very steep rock slope. The accumulated mass of such loose, broken rock formed chiefly by falling, rolling, or sliding.

**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.

**Terminal moraine.** A belt of thick glacial drift that generally marks the termination of important glacial advances. It commonly is a massive arcuate ridge or complex of ridges underlain by till and other types of drift.

**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). A layer of otherwise suitable soil material that is too thin for the specified use.

**Till plain.** An extensive nearly level to gently rolling or moderately sloping area that is underlain by or consists of till and that has a slope of 0 to 8 percent.

**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. Toe slopes are commonly gentle and linear in profile.

**Too arid** (in tables). The soil is dry most of the time, and vegetation is difficult to establish.

**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.

**Toxicity** (in tables). Excessive amount of toxic substances, such as sodium or sulfur, that severely hinder establishment of vegetation or severely restrict plant growth.

**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.

**Trafficability.** The degree to which a soil is capable of supporting vehicular traffic across a wide range in soil moisture conditions.

**Tread.** The relatively flat terrace surface that was cut or built by stream or wave action.

**Tuff.** A compacted deposit that is 50 percent or more volcanic ash and dust.

**Understory.** Any plants in a forest community that grow to a height of less than 5 feet.

**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.** An elongated depression area primarily developed by stream action.

**Valley fill.** In glaciated regions, material deposited in stream valleys by glacial meltwater. In nonglaciated regions, alluvium deposited by heavily loaded streams.

**Variation.** Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

**Varve.** A sedimentary layer or a lamina or sequence of laminae deposited in a body of still water within a year. Specifically, a thin pair of graded glaciolacustrine layers seasonally deposited, usually by meltwater streams, in a glacial lake or other body of still water in front of a glacier.

**Very deep soil.** A soil that is more than 60 inches deep over bedrock or to other material that restricts the penetration of plant roots.

**Very shallow soil.** A soil that is less than 10 inches deep over bedrock or to other material that restricts the penetration of plant roots.

**Water bars.** Smooth, shallow ditches or depression areas that are excavated at an angle across a sloping road. They are used to reduce the downward velocity of water and divert it off and away from the road surface. Water bars can easily be driven over if constructed properly.

**Waterspreading.** Diverting runoff from natural channels by means of a system of dams, dikes, or ditches and spreading it over relatively flat surfaces.

**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 oven-dry basis, at which a plant (specifically a sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

**Windthrow.** The action of uprooting and tipping over trees by the wind.



# Accessibility Statement

---

This document is not accessible by screen-reader software. The U.S. Department of Agriculture is committed to making its electronic and information technologies accessible to individuals with disabilities by meeting or exceeding the requirements of Section 508 of the Rehabilitation Act (29 U.S.C. 794d), as amended in 1998. Section 508 is a federal law that requires agencies to provide individuals with disabilities equal access to electronic information and data comparable to those who do not have disabilities, unless an undue burden would be imposed on the agency. The Section 508 standards are the technical requirements and criteria that are used to measure conformance within this law. More information on Section 508 and the technical standards can be found at [www.section508.gov](http://www.section508.gov).

If you require assistance or wish to report an issue related to the accessibility of any content on this website, please email [Section508@oc.usda.gov](mailto:Section508@oc.usda.gov). If applicable, please include the web address or URL and the specific problems you have encountered. You may also contact a representative from the [USDA Section 508 Coordination Team](#).

## Nondiscrimination Statement

In accordance with Federal civil rights law and U.S. Department of Agriculture (USDA) civil rights regulations and policies, the USDA, its Agencies, offices, and employees, and institutions participating in or administering USDA programs are prohibited from discriminating based on race, color, national origin, religion, sex, gender identity (including gender expression), sexual orientation, disability, age, marital status, family/parental status, income derived from a public assistance program, political beliefs, or reprisal or retaliation for prior civil rights activity, in any program or activity conducted or funded by USDA (not all bases apply to all programs). Remedies and complaint filing deadlines vary by program or incident.

Persons with disabilities who require alternative means of communication for program information (e.g., Braille, large print, audiotape, American Sign Language, etc.) should contact the responsible Agency or USDA's TARGET Center at (202) 720-2600 (voice and TTY) or contact USDA through the Federal Relay Service at (800) 877-8339. Additionally, program information may be made available in languages other than English.

To file a program discrimination complaint, complete the USDA Program Discrimination Complaint Form, AD-3027, found online at [http://www.ascr.usda.gov/complaint\\_filing\\_cust.html](http://www.ascr.usda.gov/complaint_filing_cust.html) and at any USDA office or write a letter addressed to USDA and provide in the letter all of the information requested in the form. To request a copy of the complaint form, call (866) 632-9992. Submit your completed form or letter to USDA by:

- (1) mail: U.S. Department of Agriculture  
Office of the Assistant Secretary for Civil Rights  
1400 Independence Avenue, SW  
Washington, D.C. 20250-9410;
- (2) fax: (202) 690-7442; or
- (3) email: [program.intake@usda.gov](mailto:program.intake@usda.gov).

USDA is an equal opportunity provider, employer, and lender.